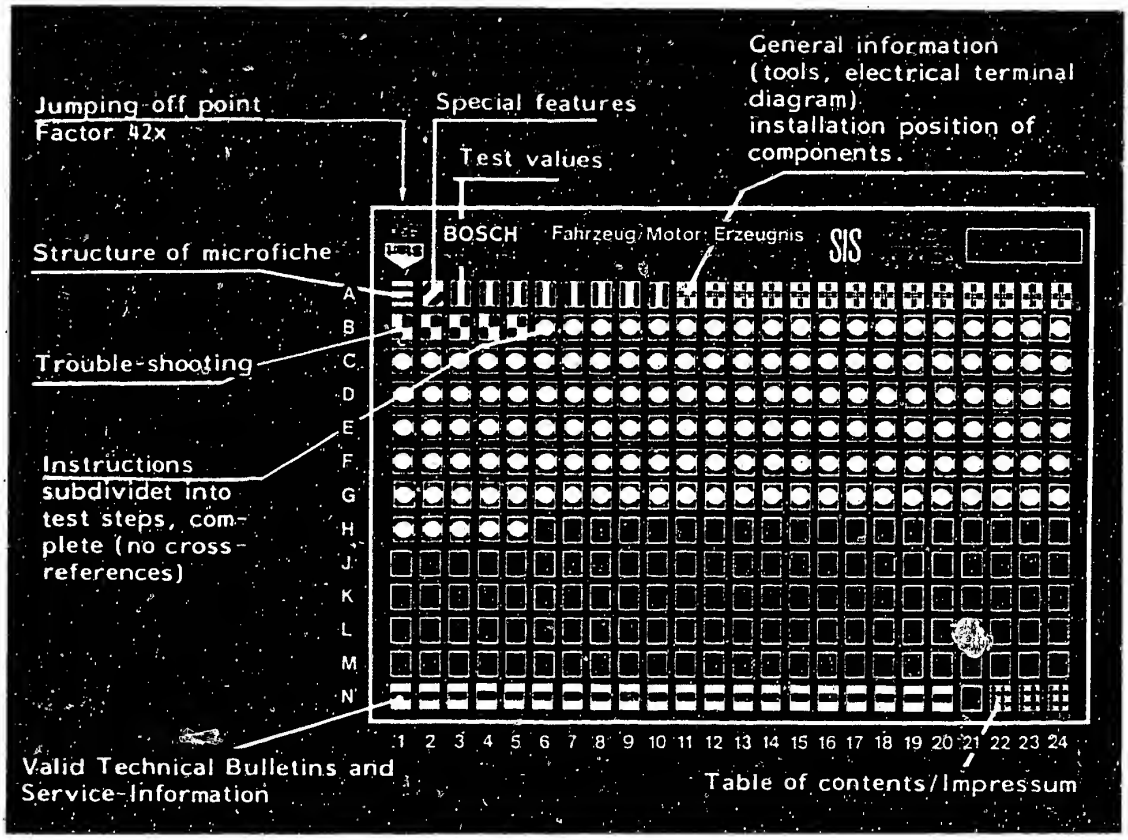
Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

E16	Product/component/test step Vehicle/engine

Coordinate

3. Limits of section

Beginning | Mid-section | End | One-page section

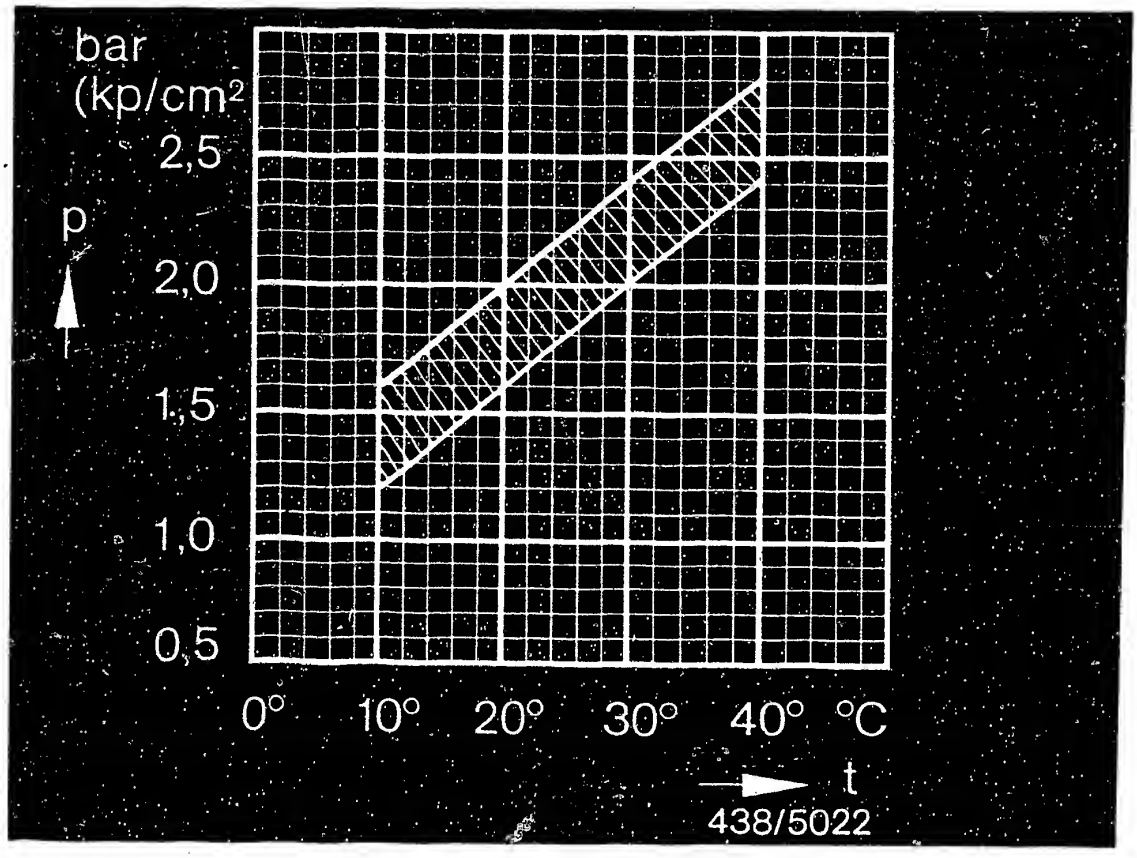
4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

1. Special features of the fuel preparation and of the exhaust gas cleaning:

- Fuel distributor with integrated pressure relief valve
- Pressure spring above the control plunger with turning lock.
- Filter in the double fitting for the fuel-distributor and warm-up regulator inlet.
- Warm-up regulator with acceleration and full load enrichment.
- Air-shrouded fuel-injection valves.
- Exhaust-gas recirculation, dependent on load and temperature (50°).
- Some vehicles have air-flow sensors with a potentiometer to indicate fuel consumption.
- Models for Sweden and Switzerland are, in addition, equipped with secondary air injection which operates when engine temperatures are above +16°C up to a rotational speed of 3000 min^{-1}.
- Electrical idle speed control instead of an auxiliary-air device.



p = Control pressure (gauge pressure)
t = Ambient pressure

2. Test specifications

2.1 "Cold" control pressure

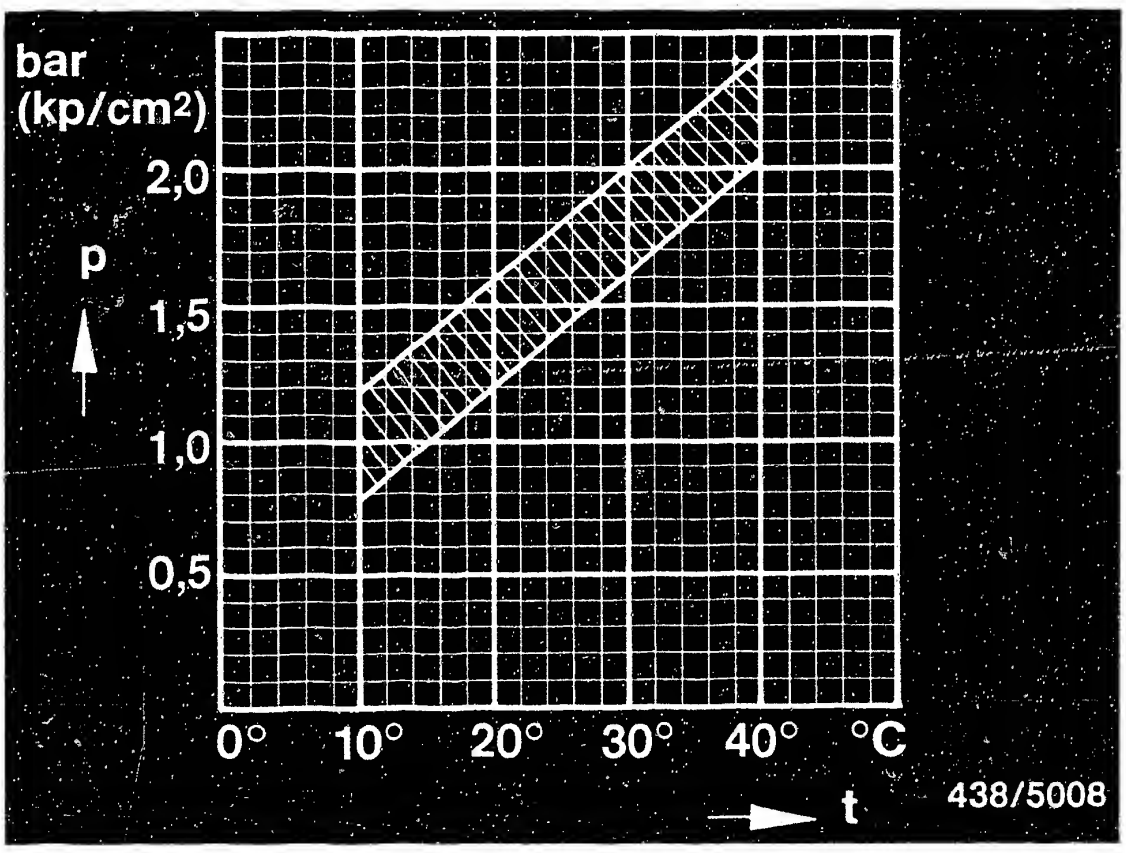
C7

- Warm-up regulator 0 438 140 061

(Version for intake-manifold-pressure-controlled full-load enrichment).

For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value: 400...600 mbar
(300...450 mmHg)



p = Control pressure (gauge pressure)
t = Ambient pressure

C7

- "Cold" control pressure

- Warm-up regulator 0 438 140 101 up to FD 344
  (Model for acceleration enrichment)

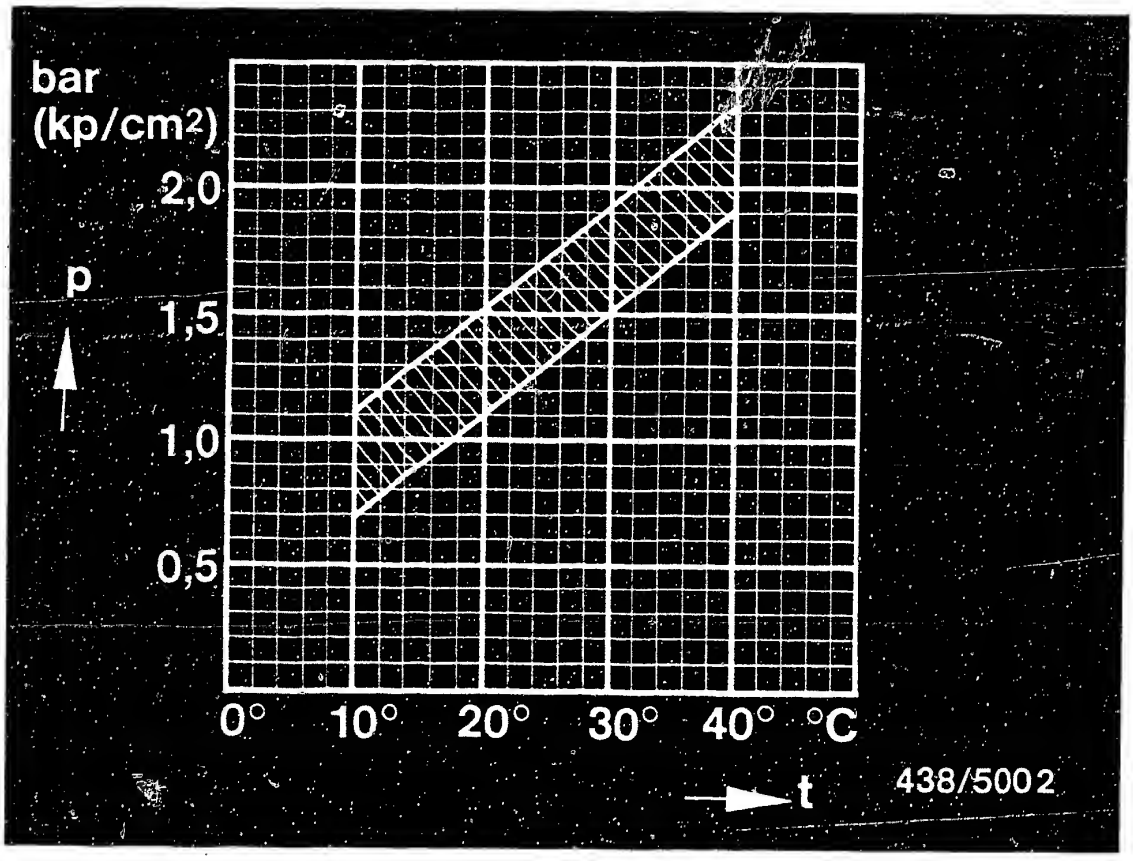
  Test with engine at standstill, i.e., no intake manifold pressure.

- Part No. of warm-up regulator: 0 438 140 134

  (Version for intake-manifold-pressure-controlled full-load enrichment).

  For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value: 400 ...600 mbar
(300 ...450 mmHg)



p = Control pressure (gauge pressure)
t = Ambient pressure

- "Cold" control pressure

- Warm-up regulator 0 438 140 101 as of FD 345
  (Model for acceleration enrichment)

Test with engine at standstill, i.e., no intake manifold pressure.

C7

Test step	Test specifications *

C7

2.2 "Warm" control pressure

- Test with engine at standstill, i.e., no intake manifold pressure.

Warm-up regulator		
0 438 140 061	up to FD 341	3.0 ... 3.4 bar
	as of FD 342	2.6 ... 3.0 bar
0 438 140 101		3.4 ... 3.8 bar
0 438 140 134		2.6 ... 3.0 bar

- Connect up vacuum pump to intake manifold connection.
  Setting value:
  400...600 mbar
  (300...450 mmHg)

Warm-up regulator	
0 438 140 061	3.4 ... 3.8 bar
0 438 140 101	2.6 ... 3.0 bar
0 438 140 134	3.4 ... 3.8 bar

2.3 Checking for leaks

Setting value:
400...600 mbar
(300...450 mmHg)

Max. allowable pressure drop from "setting value": 100 mbar (75 mmHg) / 15 s

* Pressures indicated in the test specifications table in bar (gauge pressure) or kgf/cm² (gauge pressure)

Test step	Test specifications *
2.4 Electric fuel pump — **B24**	
Fuel delivery:	
3.8 l engine	min. 1000 cm³/30s
5.0 l engine	min. 1100 cm³/30s
2.5 Primary pressure — **D17**	
Fuel distributor part no.	
0 438 100 111/ ...112 0 438 100 068/ ...089	
Test specification:	4.7...5.4 bar(4.8...5.5 kgf/cm²)
Setting value:	4.9...5.1 bar(5.0...5.2 kgf/cm²)
2.6 Checking for leaks — **E1**	
Minimum pressure after 10 minutes:	2.7 bar (2.8 kgf/cm²)
after 20 minutes:	2.6 bar (2.7 kgf/cm²)
2.7 Fuel-injection valves — **E21**	
0 437 502 010	
Opening pressure:	3.0...4.1 bar(3.1...4.2 kgf/cm²)

* Pressures indicated in the test specifications table in bar or in kgf/cm² (gauge pressure)

2.8 Fuel distributor

Comparative measurement of
the deliveries from the outlets:

Fuel distributor No. 0 438 100 068 0 438 100 089	Setting point $cm^3/min.$	Max. allowable delivery $cm^3/min.$
Idle	6.0	7.2
Part load	30.0	32.5
Full load	145.0*	160.0
Fuel distributor No. 0 438 100 111/...112		
Idle	6.0	6.6
Part load	30.0	32.5
Full load	120.0*	132.0

* At least these full load setting deliveries must be attained with maximum deflection of the air-flow sensor plate.

2.9 Idle adjustment 1)

F18

Idle speed	
3.8 l:	700...800 min^{-1}
5.0 l:	600...750 min^{-1}
CO-content	
3.8 l / 5.0 l:	0.7...1.3 vol%CO

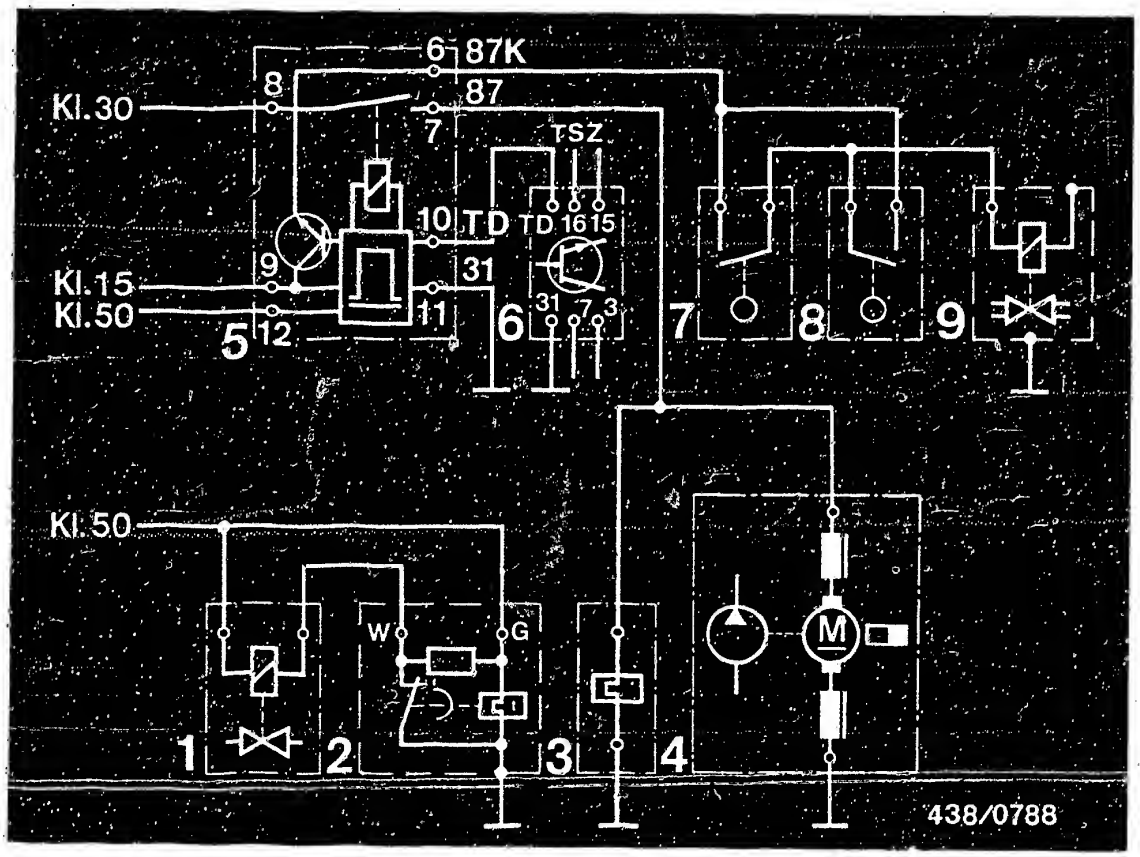
1) For adjusting or checking the idle:
Engine at normal operating temperature, oil temperature approx. +80°C.
Air conditioner turned off. Exhaust gas recirculation and secondary air injection not in operation.

2) In "park" or "neutral", with coolant temperature above +42°C.
The idle speed cannot be adjusted due to the electronic idle speed control. If the idle speed is incorrect, check the idle speed control.

2.10 Potentiometer on the air-flow sensor

G22

Total resistance	3000 ... 5000 Ω
Idle resistance	500 ... 900 Ω
Full load resistance	3500 ... 6000 Ω



3. Electrical safety circuit

3.1 Circuit diagram

1 = Start valve
2 = Thermo-time switch
3 = Warm-up regulator
4 = Electric fuel pump
5 = Electronic relay
6 = Trigger box of transistorized ignition system (TCI)
7 = Kick-down switch
8 = Switch (selector lever position "B")
9 = Automatic transmission solenoid-operated valve

The safety circuit employs an electronic relay which is triggered from terminal TD of the trigger box of the transistorized ignition system.

Additional functions of the electronic relay:

- Protection against overevving:

  At an engine speed of 5950+50 min^{-1} the electric fuel pump is switched off in order to limit the engine speed.

- Kick-down cut-off:

  The power supply to the solenoid-operated valve (9) of the automatic transmission is from terminal 87K of the electronic relay.
  200 min^{-1} before the cut-off speed of the engine (cut-off of the electric fuel pump) the electronic relay cuts the power supply to the solenoid-operated valve and the transmission shifts to the next gear.

The following are also located in the power supply:

- The kick-down switch (7)

  The kick-down switch is actuated when accelerating with wide-open throttle.

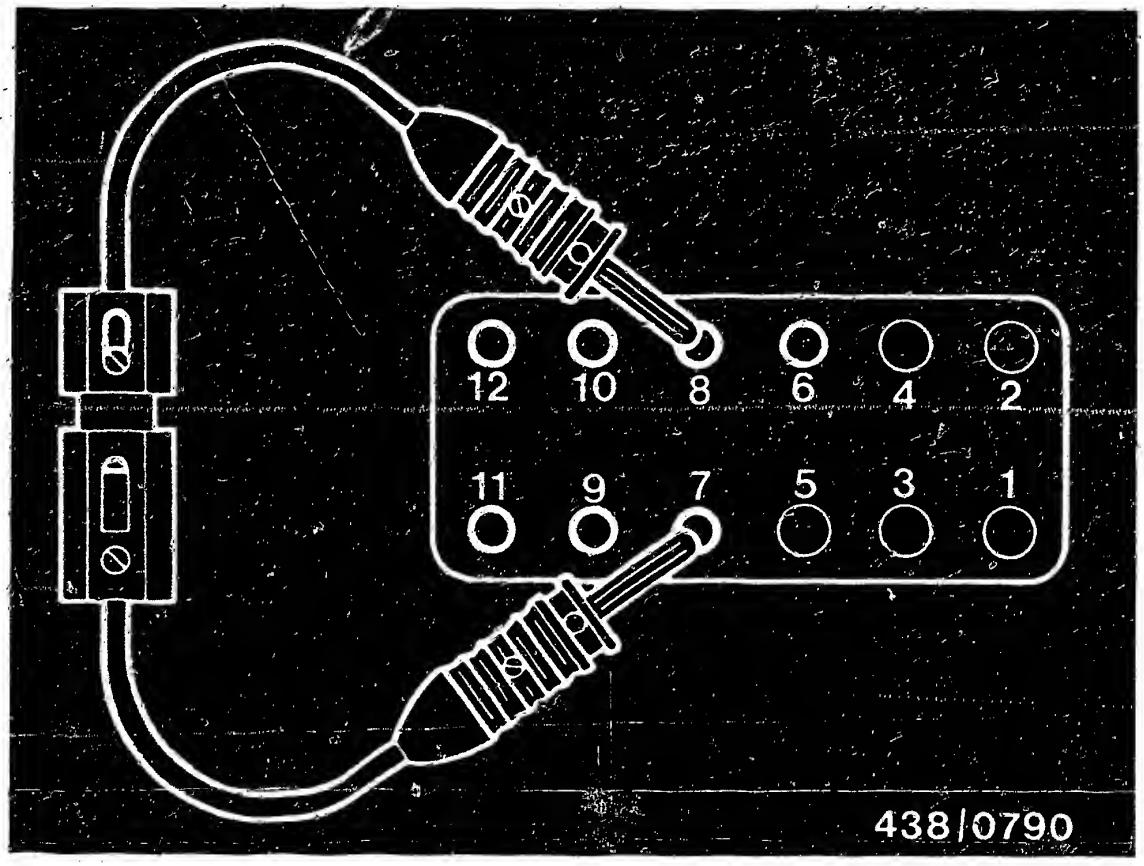
- Switch (8)

  The switch is switched by the selector lever in position "B" (braking).

3.2 Jumping the safety circuit

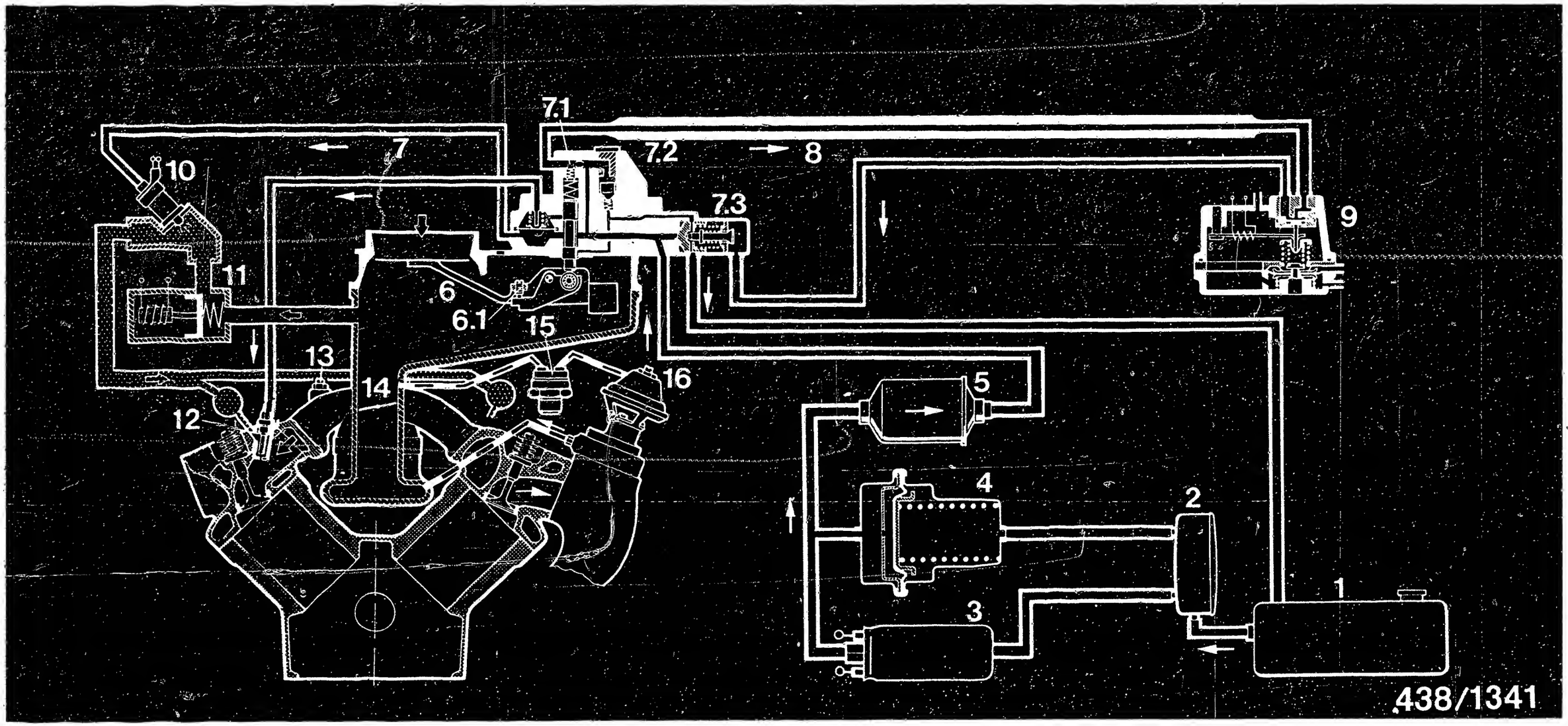
In order to run the testing jobs with the engine at standstill, jump the safety circuit.

To do so, pull the electronic relay (arrow), located in the fuse box in the engine compartment, on the left in front of the windshield, out of the relay plate.



6 = from the kick-down switch
7 = to the warm-up regulator and electric fuel pump
8 = from the battery
9 = from the ignition switch
10 = from the ignition trigger box
11 = from the vehicle ground
12 = from the starting switch

Connect sockets 7 (87) and 8 (30) in the base.
Use connecting cable 1.5 mm^2 with fuse holder and 16 A fuse (to be user-fabricated according to sketch).
Electric fuel pump and warm-up regulator are now supplied with battery voltage.



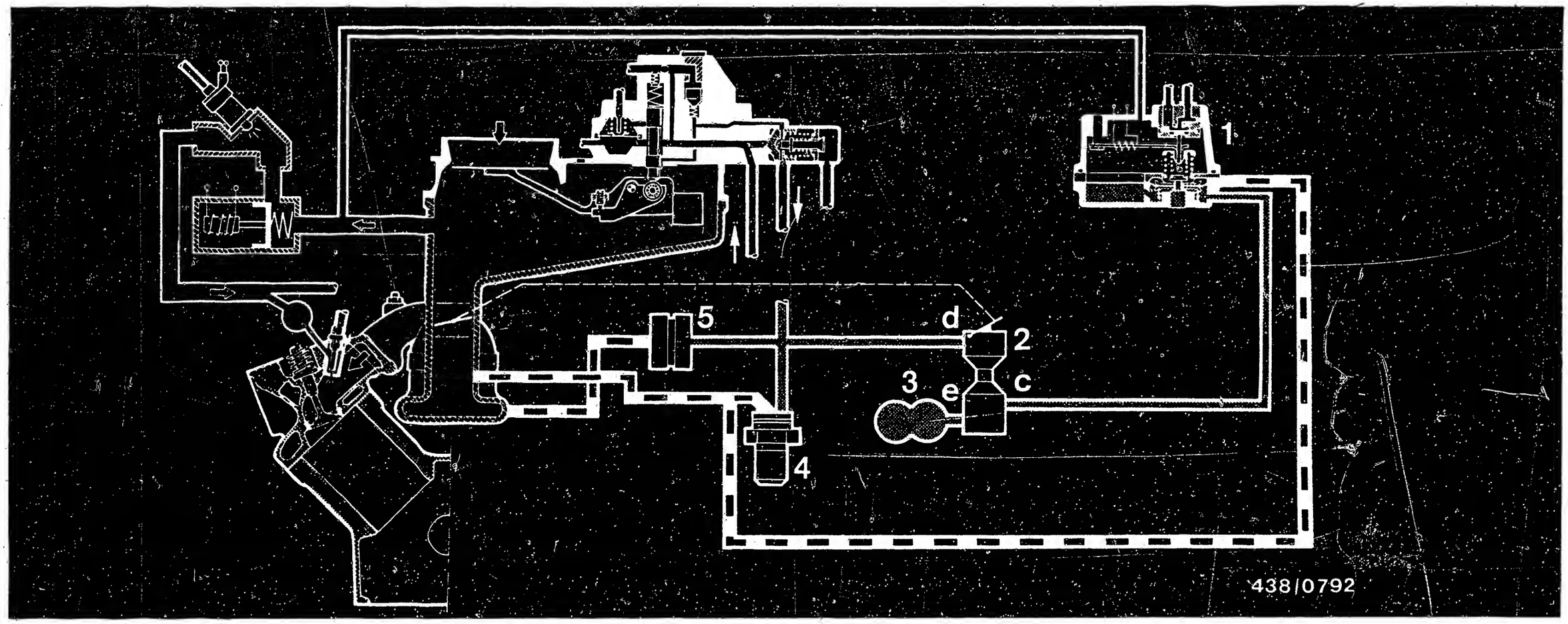
4. Diagram of fuel and idle air lines, exhaust-gas recirculation

1 = Fuel tank
2 = Intake-noise damper
3 = Electric fuel pump
4 = Fuel accumulator
5 = Fuel filter
6 = Downdraft air-flow sensor
6.1 = Idle-mixture-adjusting screw
7 = Fuel distributor
7.1 = Capsule valve with locating spring
7.2 = Pressure relief valve
7.3 = Push-up valve
8 = Damping control pressure line
9 = Warm-up regulator
10 = Start valve
11 = Idle-starting motor
12 = Injection valve
13 = Thermo-time switch
14 = Throttle valve
15 = Thermo-valve
16 = Exhaust-gas recirculation valve

Fuel lines

Intake manifold delivery lines

Intake manifold pressure control lines



4.1 Layout of lines for warm-up regulator control

1 = Warm-up regulator
2 = Change-over valve
3 = Vacuum reservoir
4 = Thermo-valve
5 = Restriction

directly acting vacuum
delayed acting vacuum due to restriction

Acceleration enrichment:
At engine temperatures below 50°C the thermo-valve is closed. The intake-manifold pressure acts directly in the warm-up regulator intermediate chamber, and acts with a delay in the lower section through the restriction and the open change-over valve (d-c). During acceleration, mixture enrichment takes place through the rapid admission of air to the intermediate chamber.

Full-load enrichment:
At temperatures above 50°C the thermo-valve is open; acceleration enrichment is switched off. At full load the change-over valve opens (e-c), and vacuum is applied to the lower section for full-load enrichment.

5. General instructions

5.1 Introduction

The following types of MB vehicles with 3.8-5.0 l/V-8-cyl. engines and K-Jetronic are covered by this microfiche card:

- 380 SE, SEC, SEL engine type 116.963 veh.type 126...
- 380 SL engine type 116.962 veh.type 107.045
  (after 10.81, models for Europe)

- 500 SE, SEC, SEL engine type 117.963 veh.type 126...
- 500 SL engine type 117.962 veh.type 107.046
- 380 SEC, SEL
  (after 10.1981, models for Sweden)

- 380 SE, SEC, SEL, SL
  (after 10.1982, models for Switzerland)

This repair manual refers only to the above-mentioned vehicles and gives a concise description of the testing and adjustment operations to be performed on the vehicle on the K-Jetronic.

All the system components are dealt with in separate working steps with the corresponding test specifications. In addition to this repair manual the appropriate testing and repair manuals will, of course, be issued for every other vehicle type equipped with the K-Jetronic.

The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation. In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - the K-Jetronic and its operation should be clearly understood. The essential points of the operation and construction of the K-Jetronic are described in Technical Instruction VDT-U 3/1 En.

5.2 Design

The entire system of the K-Jetronic in these vehicle types corresponds, with the exception of the differences listed below, to the basic design as described in Technical Instruction VDT-U 3/1 En.

5.3 The following components are different or extra:

- Intake-noise damper in the fuel intake line (for preventing intake noises) between fuel tank and electric fuel pump.

- Electric fuel pump with replaceable non-return valve.

- Fuel accumulator with doubled storage volume (40 cm^3) and only one connection on the accumulator side. The spring chamber is not vented to the atmosphere but is connected to the fuel intake line via a hose to the intake-noise damper.

- 8-cylinder mixture-control unit with downdraft air-flow sensor.

- Fuel distributor with adjustable differential-pressure valves. In this type of fuel distributor, screw plugs are situated adjacent to the fittings for the fuel-injection lines.
  This possibility for adjustment has only been introduced for production at the works. This does not result in any additional adjustment possibilities for the After-Sales Service Organization. For this reason, the fuel distributor is to be dealt with in precisely the same manner as the conventional model. The screw plugs must not be removed or loosened.

- Fuel distributor with integral pressure-relief valve on the control-pressure dome. Opens at below 0.3 bar gauge pressure, as a result of which the gauge pressure drops to 0 bar. This prevents the control plunger from possibly being sucked upward as the engine cools down.
- Compression spring above the control plunger to ensure that the control plunger does not turn.
- Control pressure line in the form of a damping line.
- Warm-up regulator for intake-manifold-pressure-dependent full-load enrichment and acceleration enrichment.
- No auxiliary-air device; instead an idle controller with idle-speed regulation (not made by Bosch).
- Injection valves with intake-air circulation. The idle-air quantity, determined by the idle controller, is led to the injection valves via two distributor pipes. Through the air-guide sleeves the idle air flows along the injection valves into the intake manifolds and is mixed with the atomized fuel.
- Exhaust gas recirculation, dependent on load and temperature (+50°C).
- Electrical safety circuit for electric fuel pump and warm-up regulator through electronic relay.
- Protection against overevving: the electric fuel pump is switched off at an engine speed of 5950 min^{-1}.
- Kick-down cut-off at engine speed of 5750 min^{-1}.
- Strainer in the double fitting of the fuel distributor inlet.
- Some vehicles have air-flow sensors with potentiometer to indicate fuel consumption.
- Models for Sweden and Switzerland are, in addition, equipped with secondary air injection operating at an engine temperature of above + 16°C up to a rotational speed of 3000 min^{-1}.

6. Test equipment and tools

- Pressure tester KDJE-P 100 (formerly KDEP 1034).
  To check all fuel pressures and to check for leaks:
- Connecting parts kit KDJE-P 100/11
  (formerly KDEP 1034/11).
  To connect the pressure tester between the fuel-distributor control pressure connection and the fuel-line-pressure damper.
- Adjusting wrench KDEP 1035
  To adjust the idle-mixture regulating screw in the mixture-control unit (CO-adjustment).
- Guide ring KDEP 1040/14 (Ø 110 mm)
- Guide ring KDEP 1040/15 (Ø 105 mm)
  To center the air-flow sensor plate in the air-flow sensor
- Tester for comparative fuel delivery KDJE-P 200
  (formerly KDJE 7451).
  For comparative measurement of fuel deliveries from the individual outlets on the fuel distributor.
- Set of leads KDJE-P 200/25 (formerly KDJE 7451/25).
  To connect the tester for comparative fuel delivery to the K-Jetronic unit with steel fuel-injection pipes
- Graduate (commercially available, capacity approx. 1.5 l)
  To measure fuel delivery from the electric fuel pump.
- Electrical connecting lead (test lead).
  KDJE 7450/70, for direct connection to the component being tested, e.g. starting valve.
- Multimeter, R_i ≧20 kΩ/V, commercially available.
- Vacuum pump (commercially available).
  To check warm-up regulators with full-load enrichment.
  For example, vacuum hand pump Mityvac from

  Firma Korinth
  Ludwig-Kloos-Straße 21
  6450 Hanau 7 (Steinheim)

- Tool set for removing and fitting the idle-speed anti-tamper device of the air-flow sensor (e.g. No. 4521/F from Fa. Hazet, 5630 Remscheid).

- Valve tester KDJE-P 400 (previously KDJE 7452).
  For testing the injection valves.

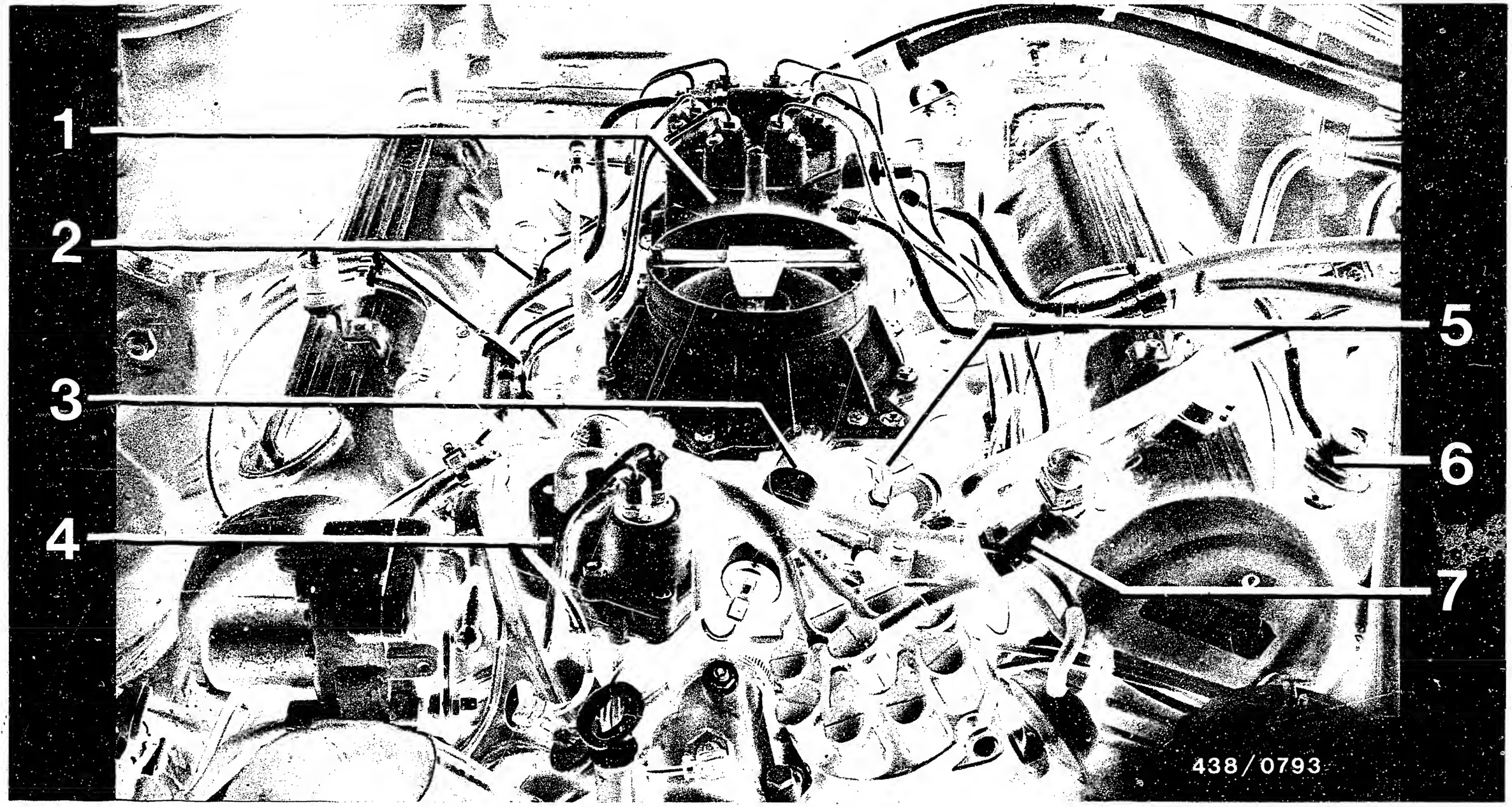
Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135) or
Bosch, Part No. VS 14 942-CH
(previously 5 973 340 650)
The calibrating fluid from Bosch can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.

- Tachometer (commercially available)
  For idle-speed adjustment.

- CO meter (commercially available)
  For idle-speed CO adjustment.

- Setting device KDJE 7456
  For deflecting the air-flow sensor plate (downdraft air-flow sensor) when comparing the fuel deliveries from the fuel-distributor outlets.

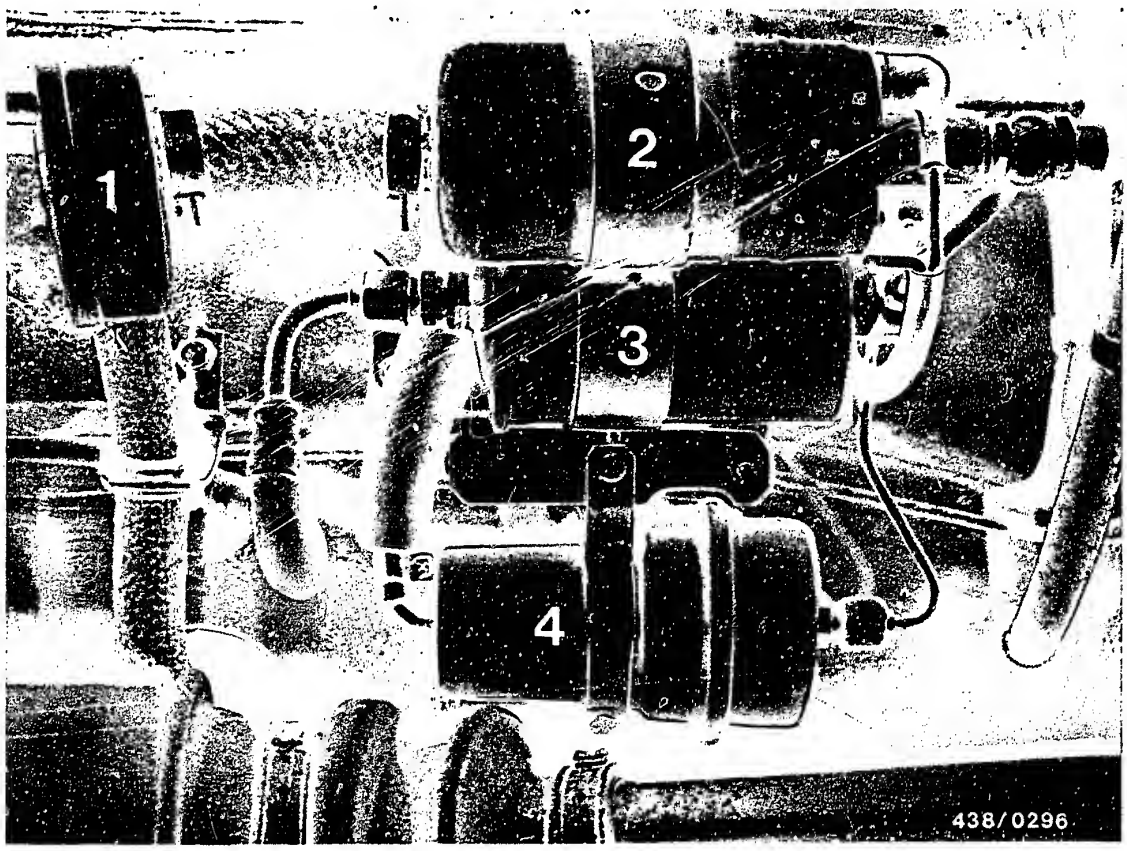


7. Installation position of components

7.1 Arrangement of components on engine

Air filter removed.

1 = Mixture-control unit
2 = Injection valves with intake-air circulation
3 = Idle controller
4 = Warm-up regulator
5 = Thermo-time switch
6 = Exhaust-gas recirculation valve
7 = Start valve



7.2 Fuel-supply components

Intake-noise damper (1), electric fuel pump (2), fuel filter (3) and fuel accumulator (4) are fastened on a support piece underneath the vehicle on the right-hand side above the rear axle.
These components are protected against road dirt by a dirt deflector (removed in the picture).
The connections of these components should be thoroughly cleaned before opening.
Pinch off the intake hose to the electric fuel pump before loosening the connections so that no fuel can escape (e.g. using hose clamper W 157 from Matra Co).

8. Trouble-shooting chart

When trouble-shooting the K-Jetronic, it is assumed that the ignition is in order and that the engine is in proper mechanical condition.

The individual test steps of this repair manual are detailed and self-contained. This permits direct trouble-shooting without having to go through the entire test program for each fault.

The trouble-shooting chart on Coordinates B 2 - B 5 is intended to make it easier to decide which test steps have to be carried out for certain faults.

According to the symptom stated by the customer or which you yourself have determined, select the possible cause in the trouble-shooting chart. The coordinate at the end of the cause column refers to the appropriate test step with the associated test specification.

Important note:

If any fuel connections are loosened, parts removed, also on the vacuum system, always use new seals when re-connecting or re-installing.

Ensure utmost cleanliness when working on the K-Jetronic. Fuel connections must be cleaned thoroughly on the outside before opening.

Trouble-shooting chart (see also Coordinates B4/B5)

Customer complaint (fault symptom)

1. Engine does not start, or starts poorly, in cold condition	2. Engine does not start, or starts poorly, in warm condition (hot-starting difficulties)*	3. Irregular idling during the warm-up phase (shakes)	4. Irregular idling with warm engine (shakes)	5. Engine does not draw gas, burbles	6. Engine misfires when operating on the road, high load	7. Insufficient power	Cause	Coordinate
	●	●	●	●		●	Vacuum system leaking	B 6
●	●		●	●	●	●	Air-flow sensor lever and/or control plunger not moving smoothly	B 8
	●						Position of the air-flow sensor plate incorrect	B 18
●		●					Idle-speed regulation not in order	G 3
●	●				●		Electrical fuel pump not operating	B 24
●							Cold-start system defective	C 3
		●	●				Cold-start valve leaking	C 3
				●			Excessive fuel delivery for control-pressure circuit	C 7
●		●					"Cold" control pressure outside tolerance	C 7
	●		●	●	●	●	"Warm" control pressure too high (after warm-up)	C 7
			●	●		●	"Warm" control pressure too low (after warm-up)	C 7
					●	●	Primary (system) pressure outside tolerance	D 17
	●						Overall fuel system leaking	E 1
●	●	●	●		●		Injection valves leaking, opening pressure too low	E 21
●	●	●	●			●	Unequal fuel delivery (imbalance of fuel delivery)	F 6
●	●	●	●	●			Basic CO adjustment incorrect	F 18
						●	Throttle valve does not open completely	---

* Note:
If, in the case of Symptom 2, after checking and repairing all the fault causes listed below, the hot-starting performance is still unsatisfactory, this can be improved by fitting a pulse relay.
The fitting of this relay is described on Coordinate N5.

Customer's complaint (fault syndrome) (continued)

8. Engine "diesels"	9. Fuel consumption too high	10. Acceleration problems	11. CO level at idle too high	12. CO level at idle too low	13. Idle speed cannot be adjusted (too high)	14. Engine starts, but dies again immediately	15. Reading for fuel consumption incorrect	Cause	Coordinates
		●		●				Vacuum system leaks	B 6
●		●	●	●				Air-sensor lever or control plunger is not moving freely	B 8
●								Position of the air-flow sensor plate is incorrect	B 18
					●			Idle-speed regulation not in order	G 3
						●		Electric fuel pump not working	B 24
●	●			●				Starting-valve leaks	C 3
		●				●		Fuel delivery for the control pressure circuit too great	C 7
		●				●		"Warm" control pressure (after warm-up) too high	C 7
	●	●	●			●		"Warm" control pressure (after warm-up) too low	C 7
		●				●		Primary pressure not within tolerance	D 17
●								Fuel-injection valves leak, opening pressure too low	E 21
		●						Uneven fuel delivery (dispersion of deliveries)	F 6
●	●	●	●	●				Basic CO adjustment incorrect	---
							●	Angle sensor (potentiometer) on air-flow sensor defective	G 22
							●	Trip computer or display instrument (non-Bosch parts) defective	---

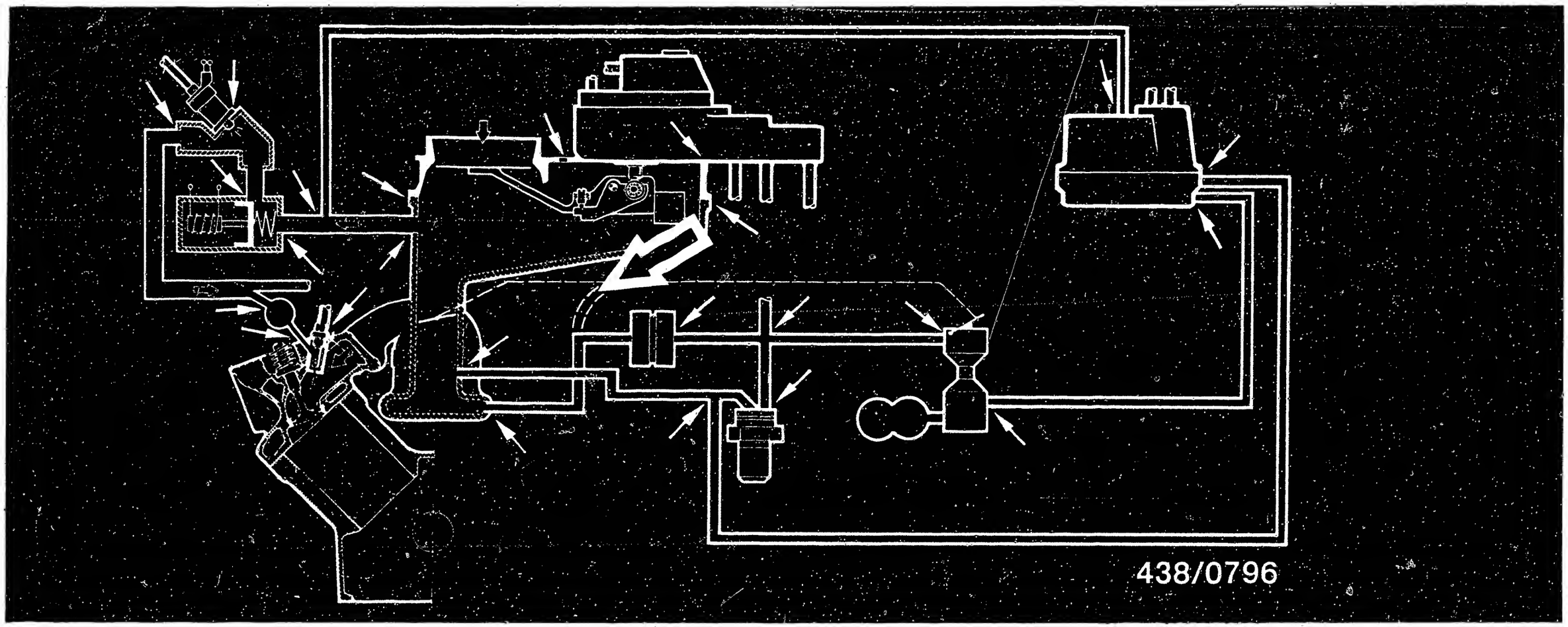
10. Check the control lever in the air-flow sensor and the control plunger in the fuel distributor for ease of movement.

10.1 Preparations

- Engine temperature not below +20°C.
- Remove the air filter so that the air-flow sensor plate becomes accessible.
- Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
  This results in application of the control pressure to the control plunger in the fuel distributor.

N. B. !

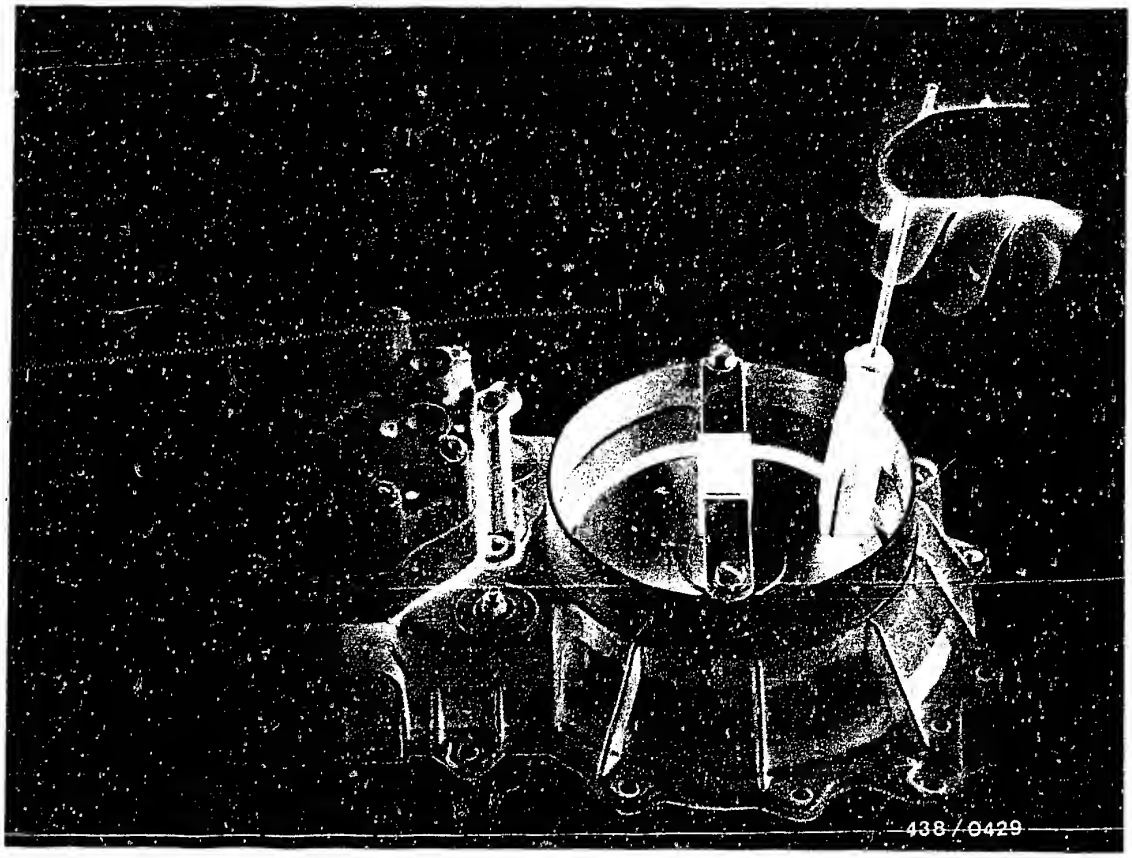
Never deflect the sensor plate (press it down) while the electric fuel pump is running. Otherwise fuel will be injected and subsequent operation of the starting motor can cause extremely serious damage to the engine!



Working steps

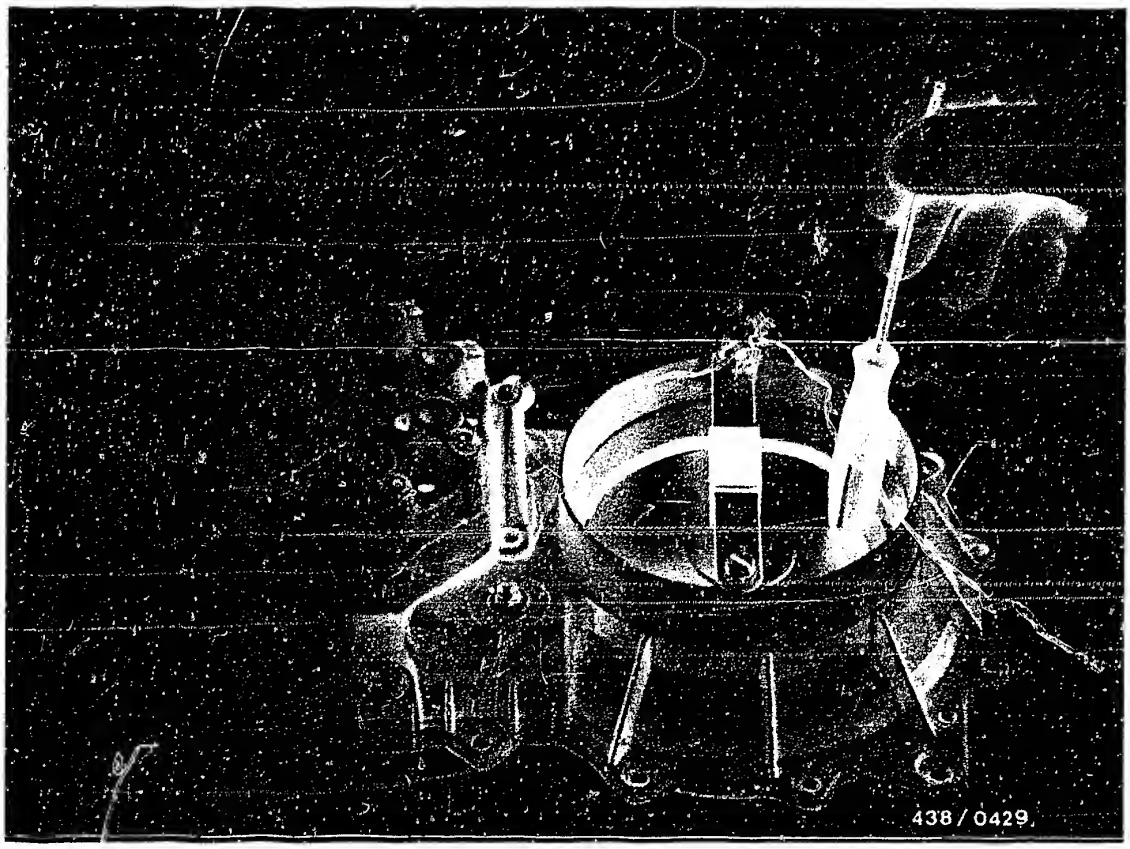
9. Check the air-intake system of the engine for leaks

The arrows in the diagram show typical points where leaks can occur.
Check by performing a visual inspection or, in cases of doubt, as follows: Disconnect the hose from the inlet of the restriction and blow air through this hose into the intake system using a compressed-air gun (large arrow). The throttle valve is to be fully open when doing this. Brush connection points with soapy water, or spray with leak detector (e.g. Güpoflex).
Under no circumstances may combustible liquids be used when testing for leaks.
The formation of bubbles or foam indicates a leak.
If a leak has been eliminated, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinates F 18.



10.2 Check that the control lever moves freely

Press down the air-flow sensor plate by hand (down-draft) and release again. The sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop. If the control lever does not move freely, first release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem. If the problem is solved by loosening the fastening screws, the seal between the air-supply housing and air-flow sensor should be changed (Mercedes-Benz service part).
Tighten the screws uniformly cross-wise to a torque of 9...10 Nm (0.9...1.0 kgf/m).
If the housing is not deformed, then the air-flow sensor must be repaired or replaced.



10.3 Check that the control plunger moves freely

Depress the air-flow sensor plate by hand (downdraft). The same resistance must be felt over the entire movement.

Move the sensor plate rapidly back to a position just in front of the zero stop. The control plunger follows this rapid movement of the sensor plate only sluggishly, and therefore initially loses contact with the sensor plate lever. It must be possible, however, to feel the plunger make contact with this lever again. If this condition is fulfilled, the control plunger can be considered to move freely.

If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor.

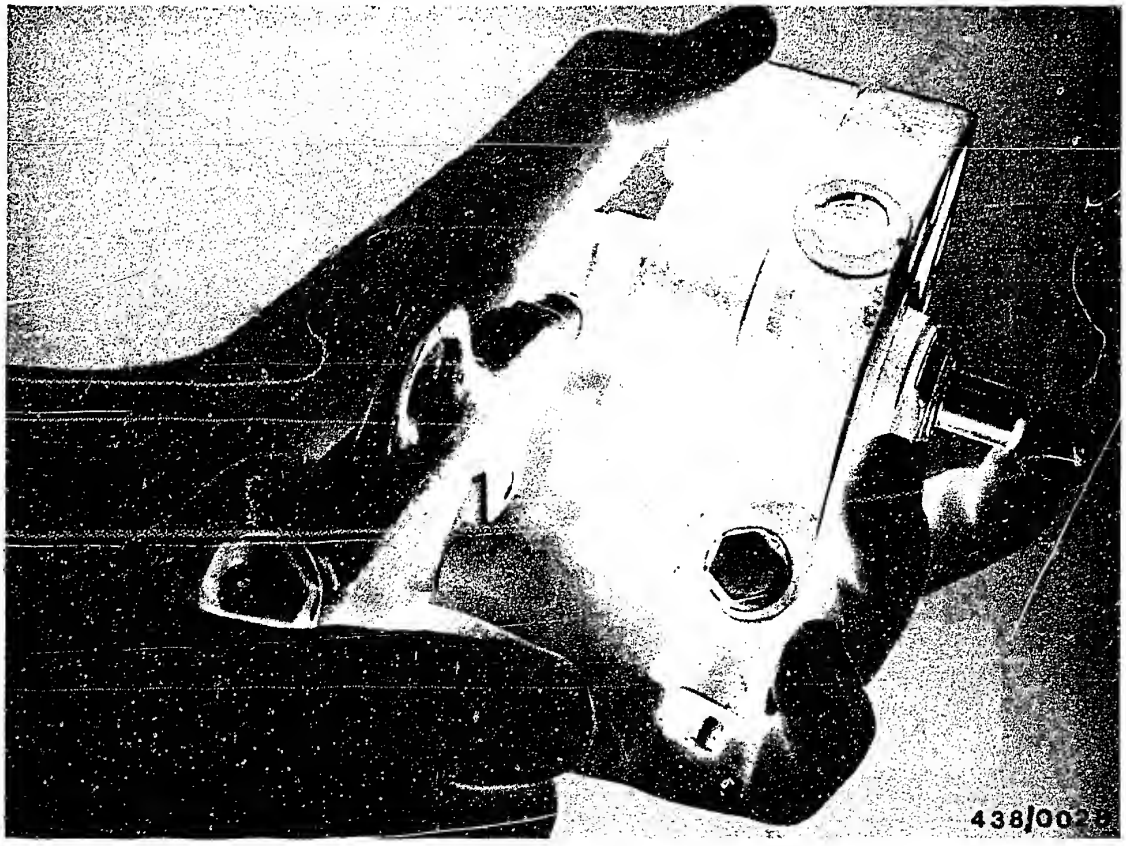
Important!

Note the following when installing fuel components and fuel lines:

Always ensure utmost cleanliness when loosening or tightening the fuel connections. No dirt must enter the fuel system.

When loosening or tightening the fuel connections, apply counter-force at the fixed hexagon of the component.

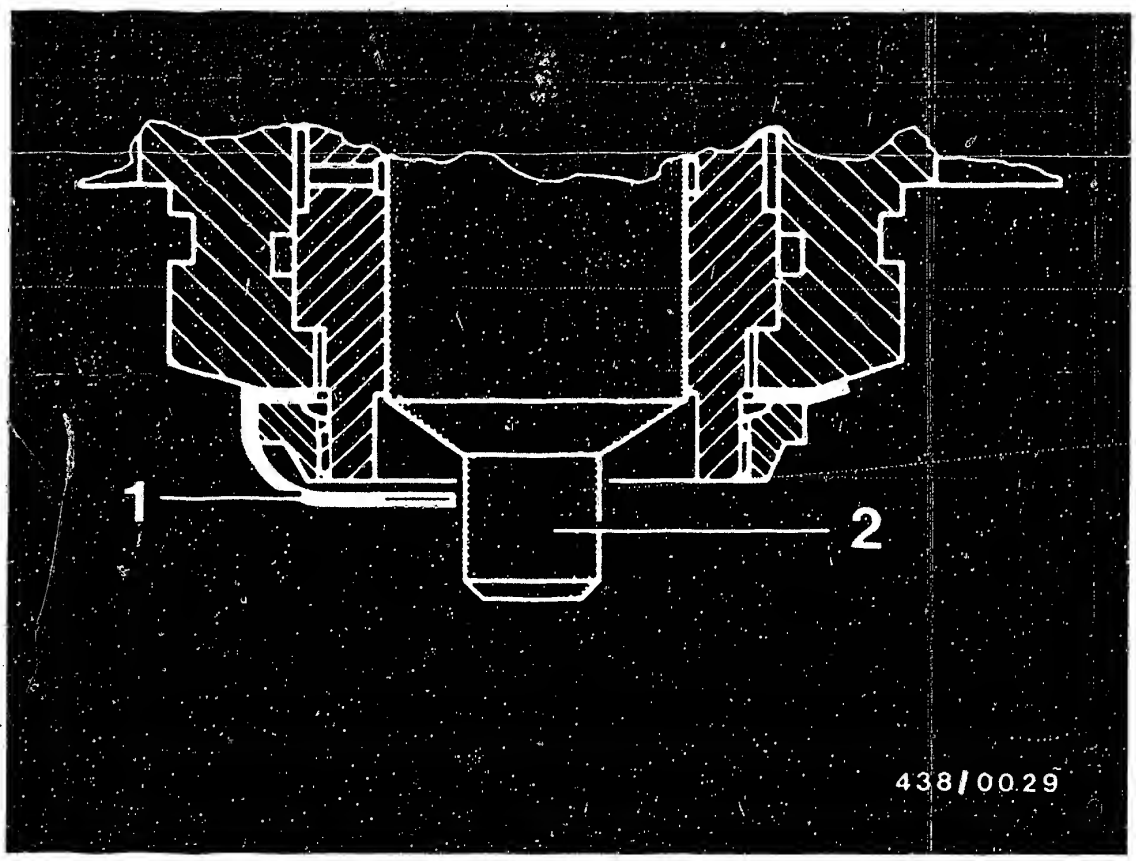
Clean the fuel distributor thoroughly in the region of the fuel connections. Screw off all connections.



Screw out three fastening screws and remove the fuel distributor from the air-flow sensor.
The steel tubing must not be bent!

Remove the plunger. Under certain conditions, in order to do this it may be necessary to blow compressed air briefly against the plunger through the control-pressure connection hole. Hold the plunger with your hand while doing this. Clean the plunger thoroughly with benzine. If the plunger still does not move freely, replace the fuel distributor.

Caution:
Fuel distributors with an integral pressure-relief valve are additionally equipped with a helical compression spring above the control plunger.
Pay attention to the compression spring when removing the control plunger and remember to fit it again when re-assembling.

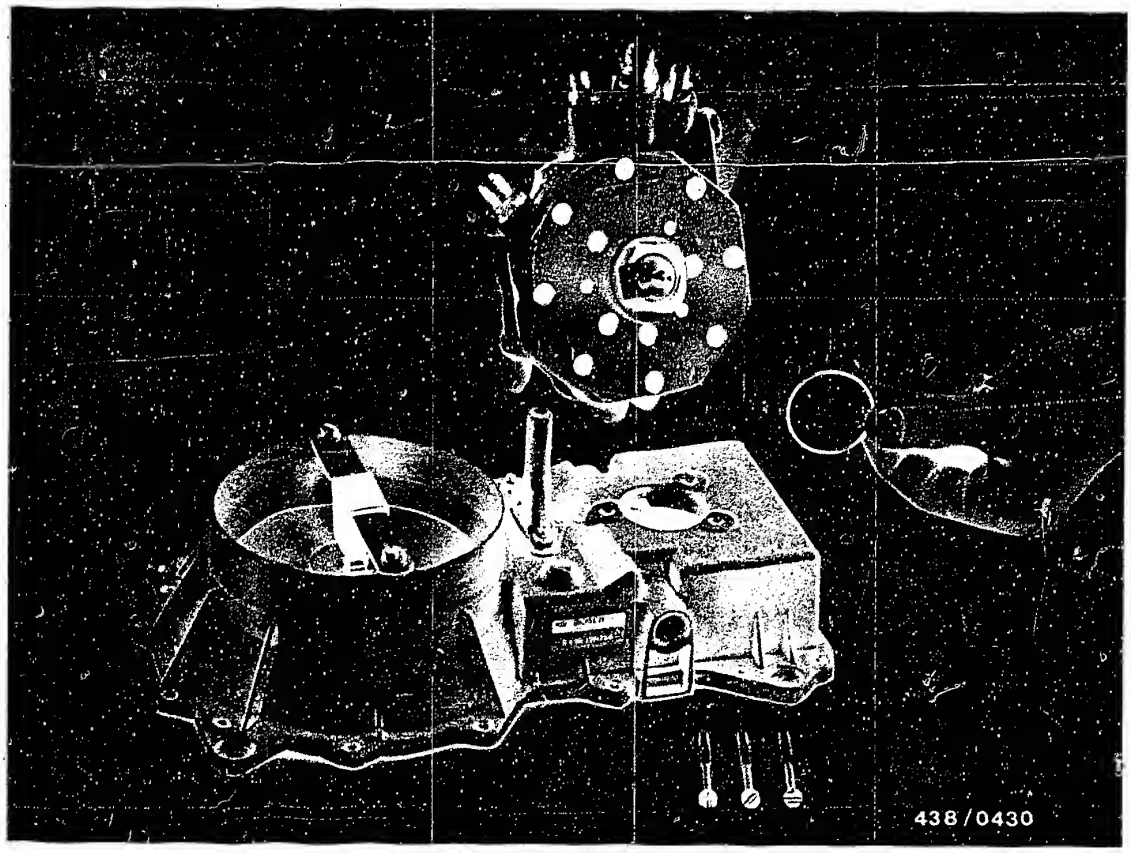


1 = Anti-drop-out device
2 = Control plunger

10.4 Fuel distributor with anti-drop-out device for the control plunger

Caution!
The fuel distributors have an anti-drop-out device for the control plunger.
This also protects the plunger in transit and facilitates installation.

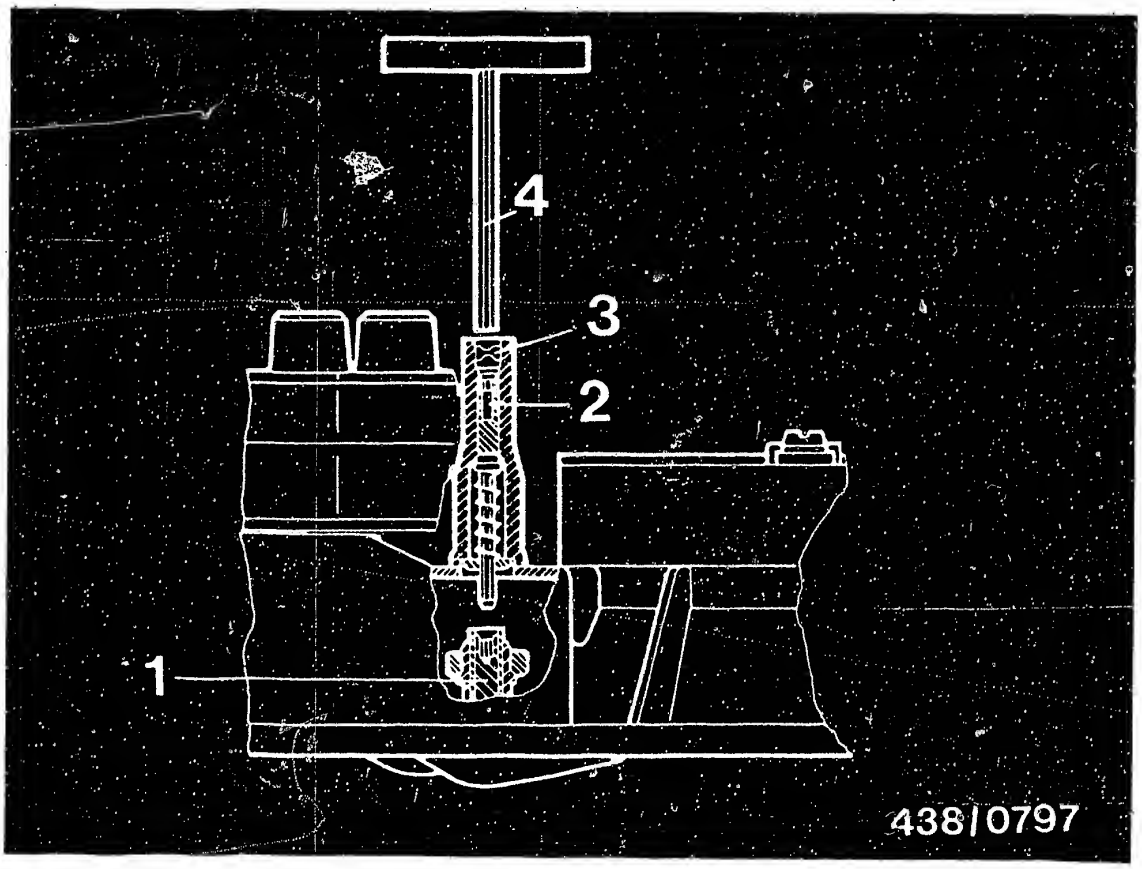
The anti-drop-out device must not be removed!



10.5 Fitting the fuel distributor

When fitting the fuel distributor, use a new seal ring between fuel distributor and air-flow sensor.
Observe the tightening torque 3.2...3.8 Nm (0.32... 0.38 kgfm) for the fastening screws precisely.
When connecting the fuel-injection tubing, use new seal rings.

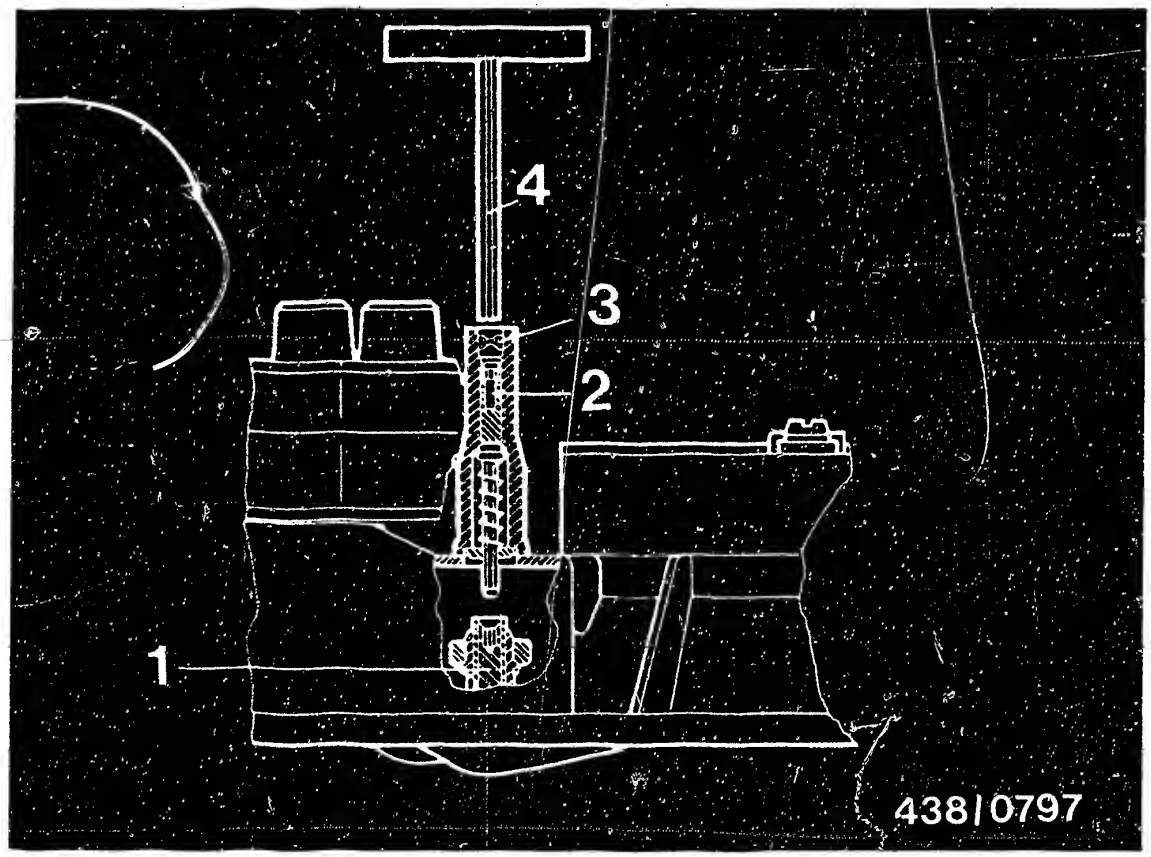
Caution:
The connection screws of the fuel-injection lines on the fuel distributor should be tightened to a torque of 10...12 Nm (1...1.2 kgfm); if tightened too much, there is the danger that the lines may be crushed.



1 = Idle-mixture-adjusting screw
2 = Adjusting device
3 = Anti-tamper device (lead seal)
4 = Adjusting wrench

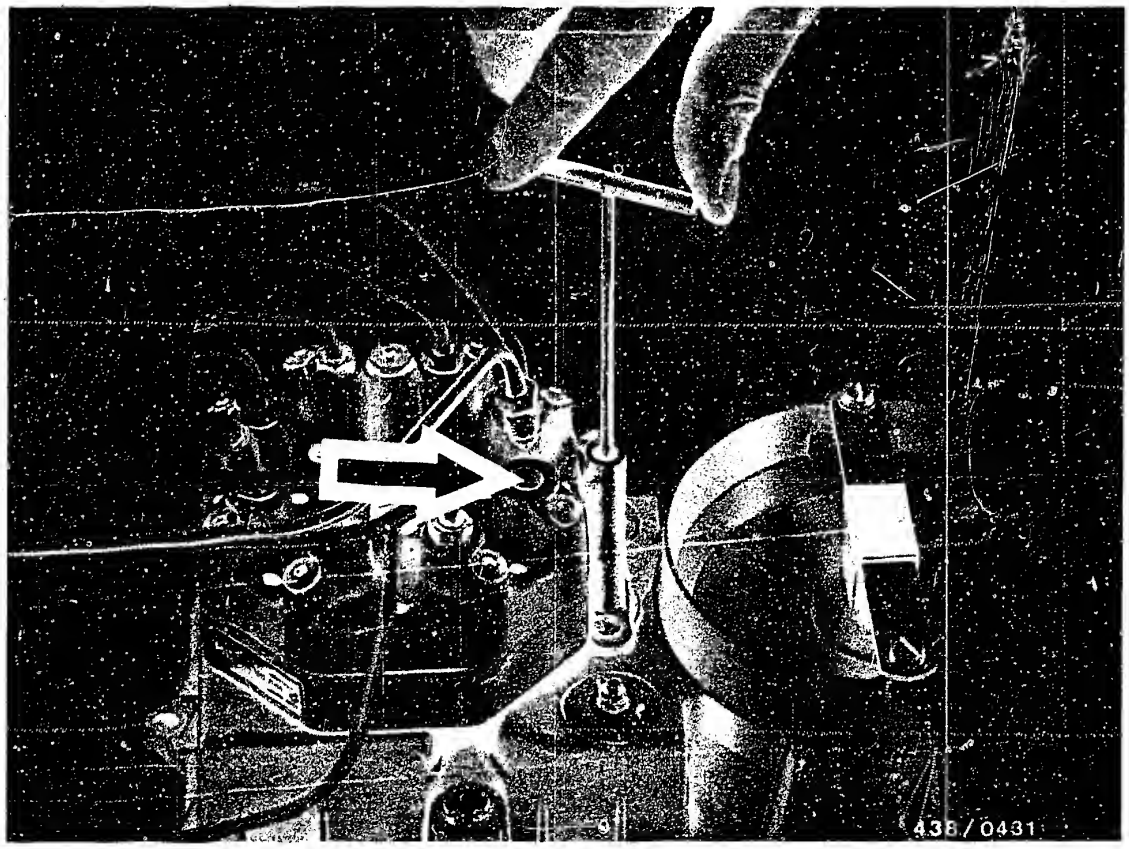
10.6 Matching the fuel distributor to the air-flow sensor for initial starting:

Screw off one fuel-injection line from the fuel distributor.
Bridge the electrical safety circuit so that the electric fuel pump operates.
The idle-mixture-adjusting screw is adjusted via a setting device rigidly fitted on the mixture-control unit with a spring-loaded hexagon-socket key.



1 = Idle-mixture-adjusting screw
2 = Setting device
3 = Anti-tamper device (lead seal)
4 = Adjusting wrench

Remove anti-tamper device (lead seal) for idle-mixture-adjusting screw.
To make the adjustment, carefully press down the pin wrench of the setting device using adjusting wrench KDEP 1035 (4) until it locks in position in the idle-mixture-adjusting screw (1).
Remove the adjusting wrench after each adjustment.
The pin wrench is forced upward by the built-in spring and automatically closes the bore to the idle-mixture-adjusting screw through an O-ring seal.

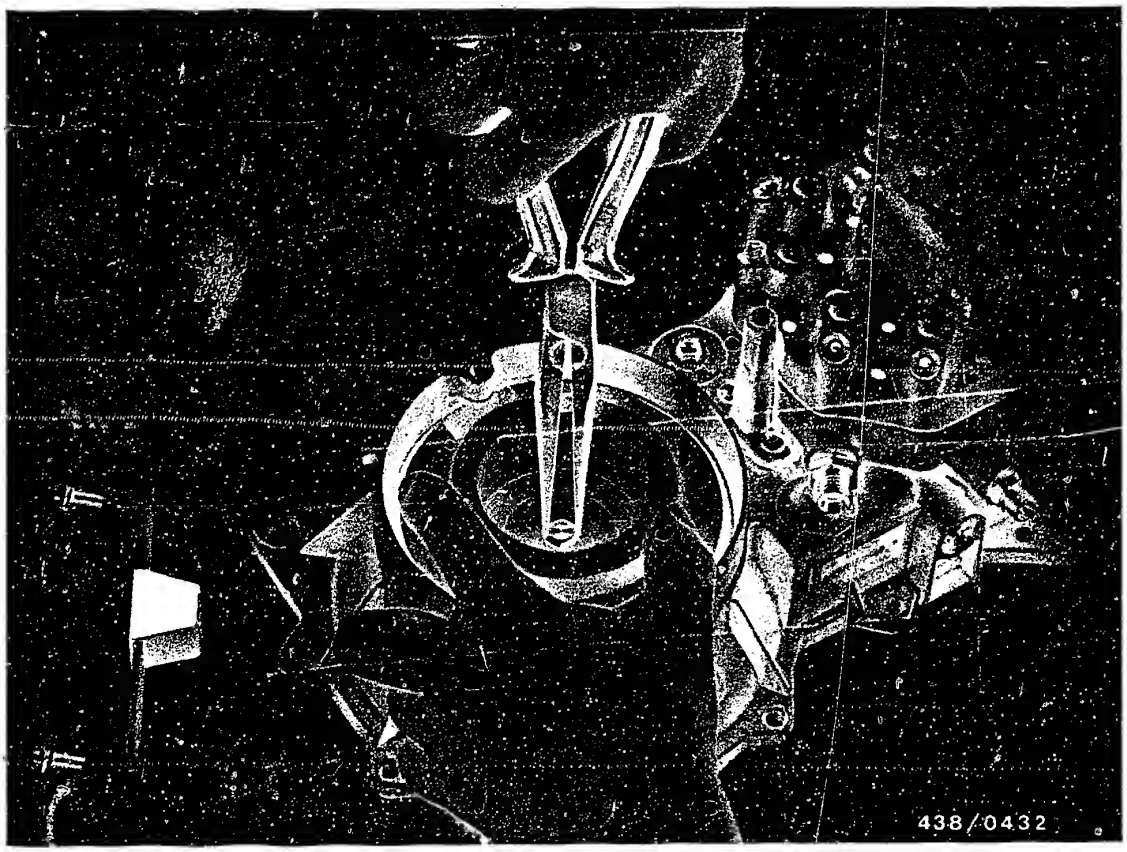


Screw in the idle-mixture-adjusting screw slowly and without exerting any great pressure on the adjusting wrench until fuel is just delivered from the open outlet (arrow) of the fuel distributor. Then turn back the adjusting screw by 1/2 turn.

Re-connect the fuel-injection line to the fuel distributor, start the engine and warm up.

The final matching of air-flow sensor and fuel distributor is carried out by adjusting the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinate F 18.



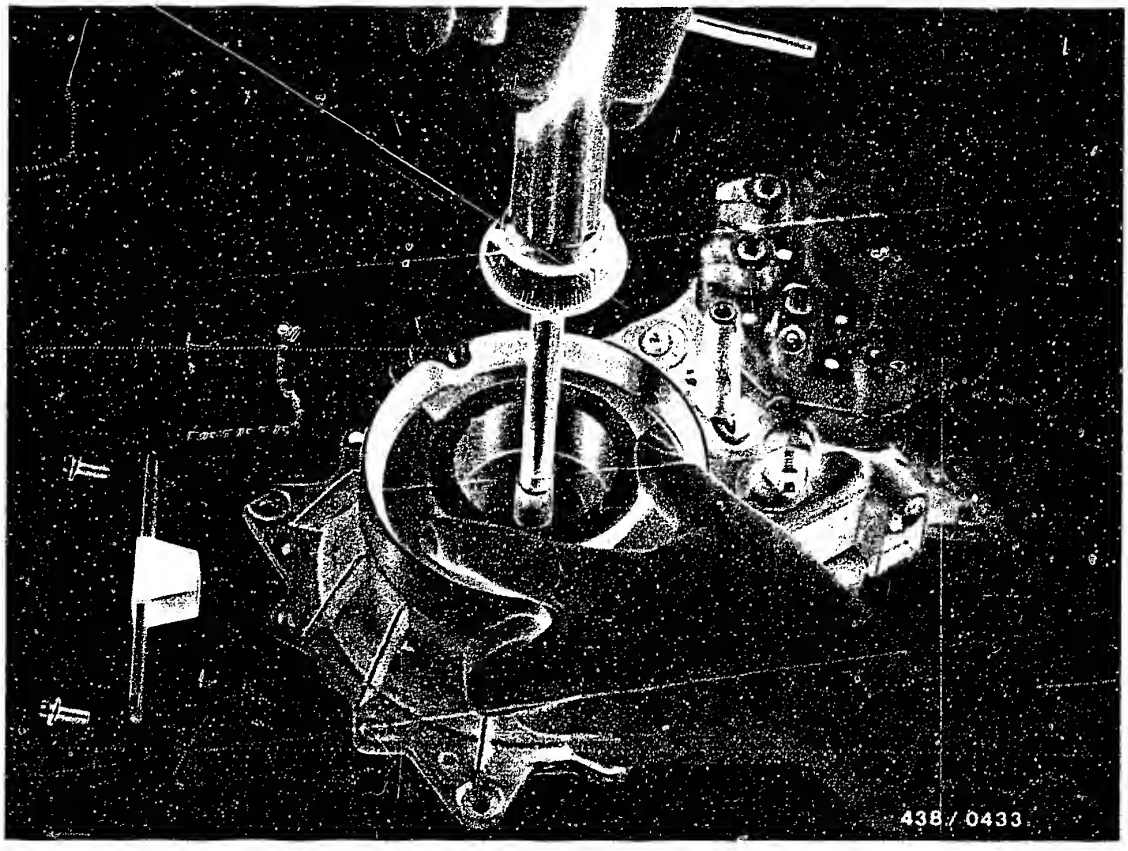
11. Checking and adjusting the position of the air-flow sensor plate

11.1 Preparations

- Engine temperature is not important.
- Remove the air filter so that the air-flow sensor plate becomes accessible.

11.2 Centering the air-flow sensor plate

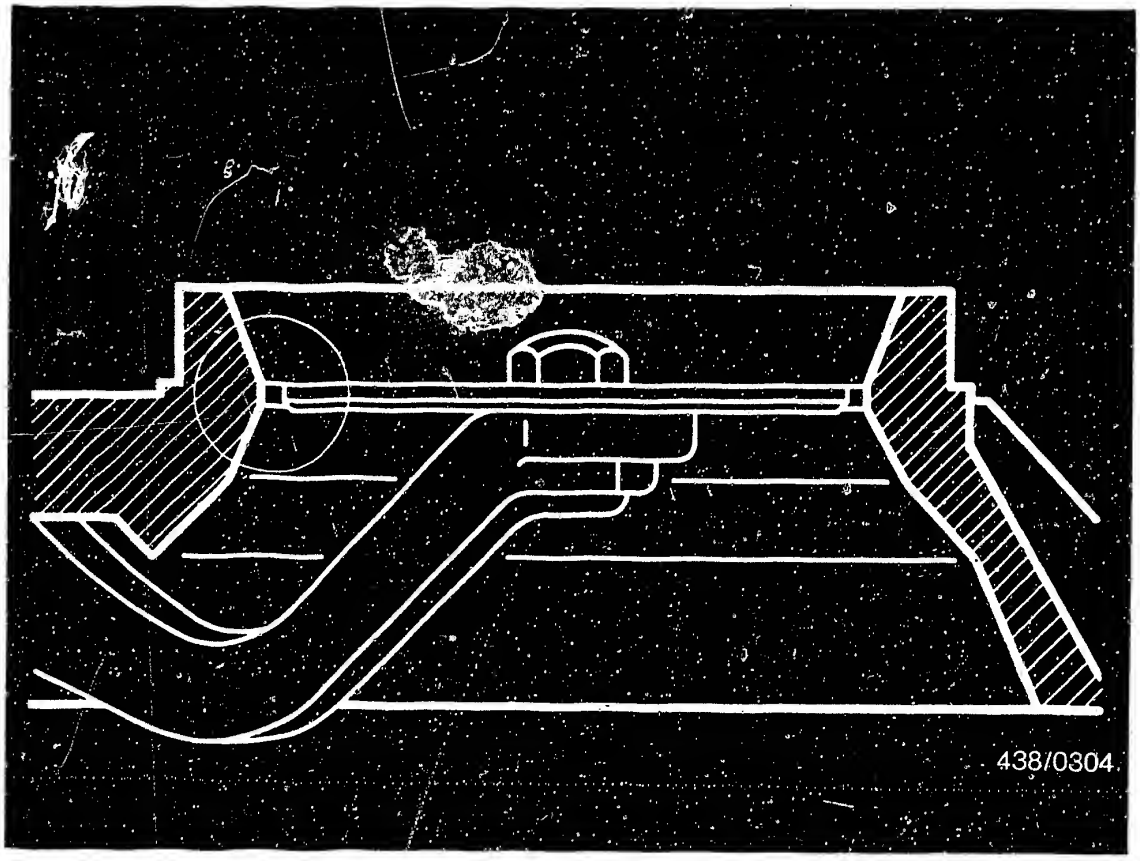
Check that the sensor plate is flat (not bent) and that it can move through the narrowest part of the air funnel without touching the funnel. If necessary, center it using a positioning ring KDEP 1040/15(dia.105 mm) or KDEP 1040/14 (dia.110 mm) as follows:
Remove the stop bracket after loosening the two fastening screws.
Loosen the sensor plate fastening screw.. Insert the positioning ring while holding the fastening screws with pliers so that the sensor plate does not deflect downwards.



With the positioning ring in place, tighten the fastening screw with a torque of 5.0...5.5 Nm, loosen again and tighten again with the same torque.

When tightening the screw make sure that the air-flow sensor plate is in its zero position (in the cylindrical part of the air funnel).

It must no longer be possible to turn the air-flow sensor plate by hand.

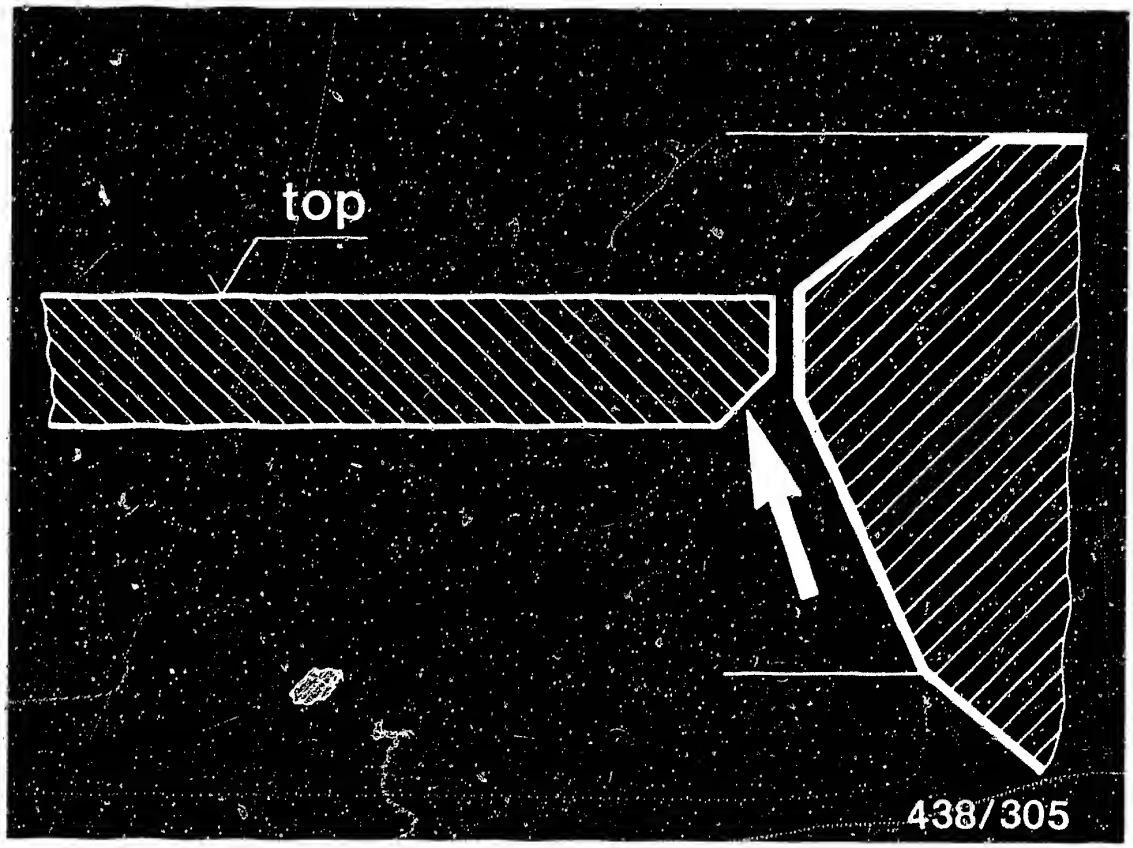


11.3 Checking and adjusting the zero position of the sensor plate
(Rest position):

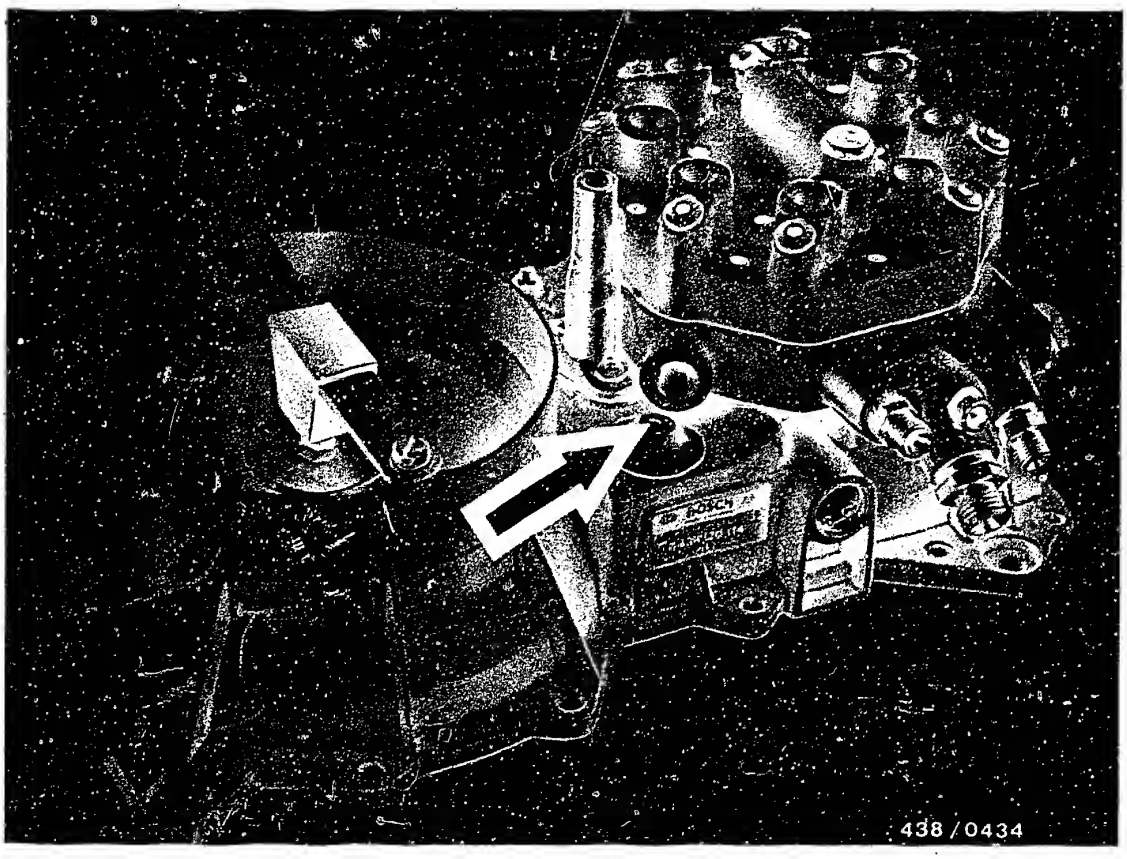
Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.

The upper edge of the sensor plate must be flush with the beginning of the cone (relief funnel, top) or max. 0.5 mm higher.

The air-flow sensor plate must be flat and must not project at any point on its circumference outside the cylindrical part of the air funnel.



Caution:
The lower edge of the sensor plate is partially chamfered. Be absolutely sure that this chamfered edge is on the bottom (arrow). The upper side of the sensor plate is (in some cases) marked by the word "top".



If the sensor plate is positioned too high, an adjustment can be made. To do this, drive the guide pin (arrow) for the leaf-spring limit-stop deeper using a mandrel and a light hammer.

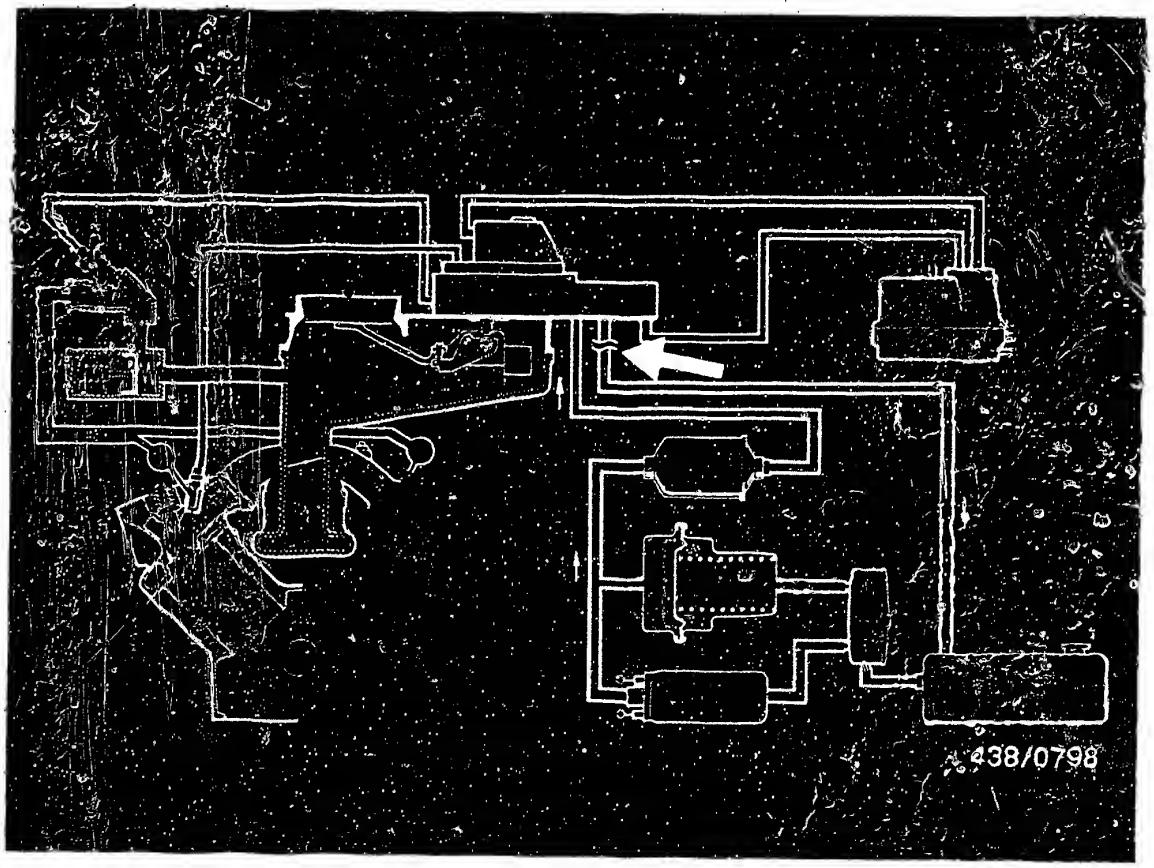
Caution:
Make this adjustment very carefully so that the guide pin is not driven in too far.
Be absolutely sure to avoid repeated adjustments in both directions because this can loosen the press fit of the pin. Serious engine damage can result if this pin should drop out.

12. Checking the operation of the auxiliary-air device

With these 8-cylinder Mercedes-Benz vehicles there is no test on the auxiliary-air device.

As of the 1982 model these vehicles are equipped with electronic idle-speed regulation (not made by Bosch) instead of with an auxiliary-air device.

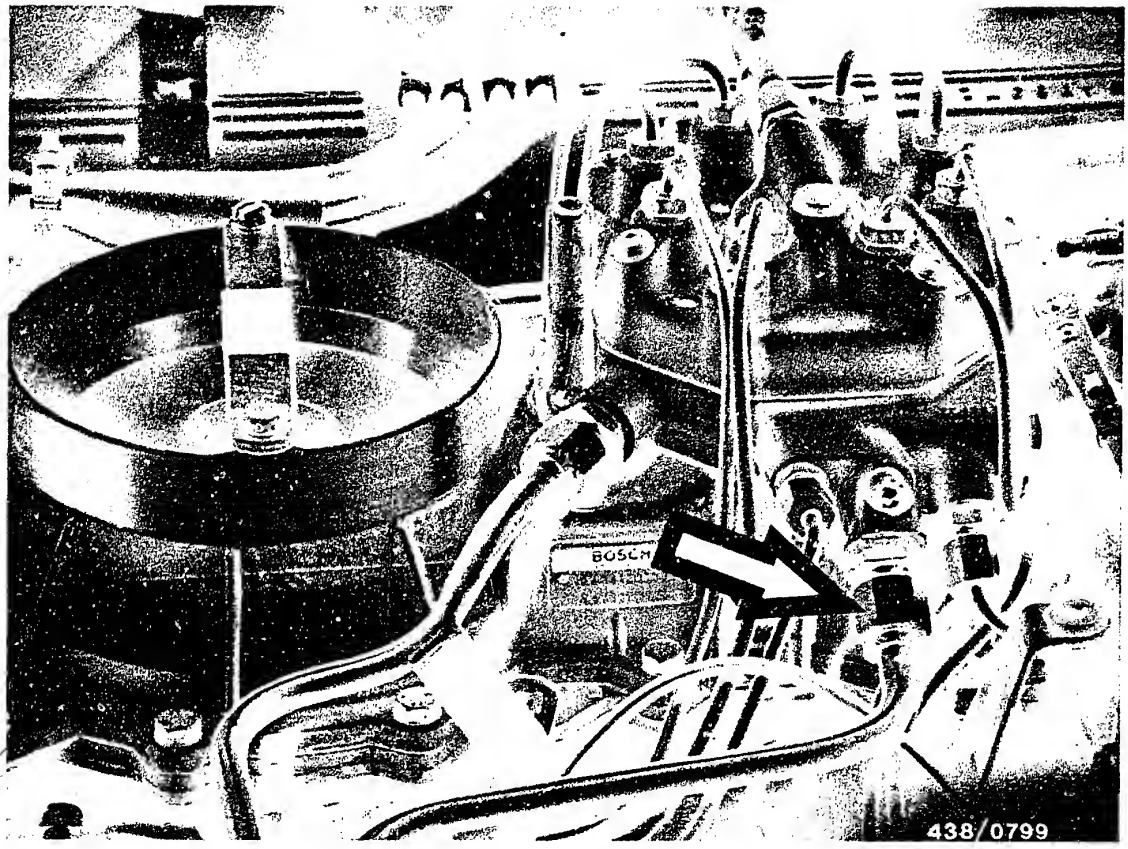
The testing of the idle-speed regulating system is described in Section 19 (Coordinate F 18).



13. Checking the operation of the electric fuel pump.

13.1 Requirement

Conclusive information on the operation of the electric fuel pump can only be given by a measurement of fuel delivery under pressure, i.e. under primary (system) pressure. This measurement must therefore be made at the return line leading to the fuel tank (arrow).



13.2 Measuring point

A suitable measuring point is the return connection on the fuel distributor (arrow). Unscrew the fuel return hose. Equip a test hose (minimum inside diameter 8mm) with an inlet union and union nut M 14 x 1.5 and connect to the return port of the fuel distributor.

Hold the test hose in a graduate (approx. 1.5 litres capacity) in order to make the measurement.

13.3 Checking

Pull off the plug from the warm-up regulator. Switch on the electric fuel pump for 30 seconds by bridging the safety circuit and collect the fuel delivered in the graduate.

N. B. !

Never deflect the sensor plate (press it down) while the electric fuel pump is running. Otherwise fuel will be injected and subsequent operation of the starting motor can cause extremely serious damage to the engine!

13.4 Test specification

Fuel delivery
3.8 l engine: at least 1000 cm^3/30 seconds
5.0 l engine: at least 1100 cm^3/30 seconds

13.5 Possible causes of insufficient fuel delivery

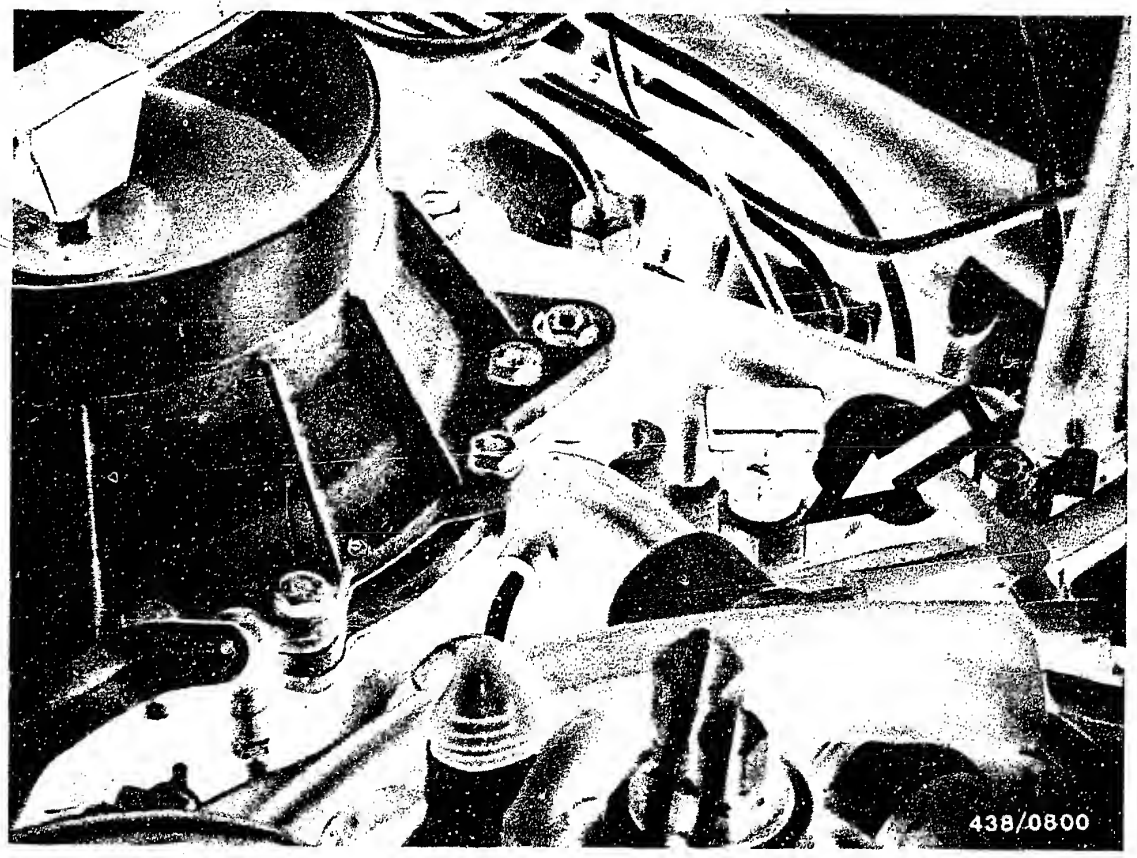
- Power supply to the electric fuel pump defective, voltage drop. Minimum voltage at terminal with pump operating = 11.5 V.
- Fuel filter very dirty.
- Strainer in the double-fitting of the fuel-distributor inlet is blocked.
- Restriction in the intake line to the fuel distributor.

If these points are O.K., the fault lies in the electric fuel pump itself.
Replace the electric fuel pump.

13.6 Removal and installation of the electric fuel pump

Pinch off the fuel intake hose from the fuel tank to the electric fuel pump (e.g. using hose clamper W 157 from Matra Co.).

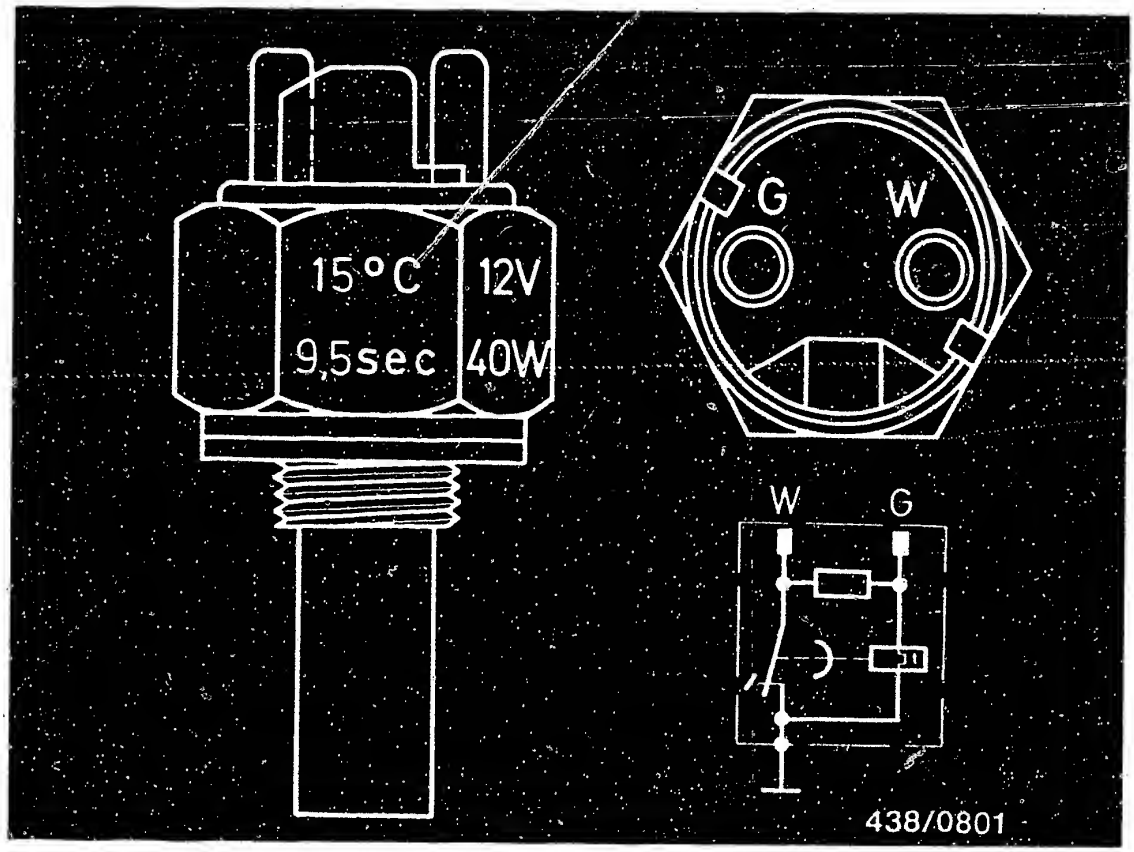
When installing, use a new seal and pay attention to the correct positioning of the electric fuel pump. Danger of bending the fuel lines.



14. Checking the cold-start system (thermo-time switch, start valve).

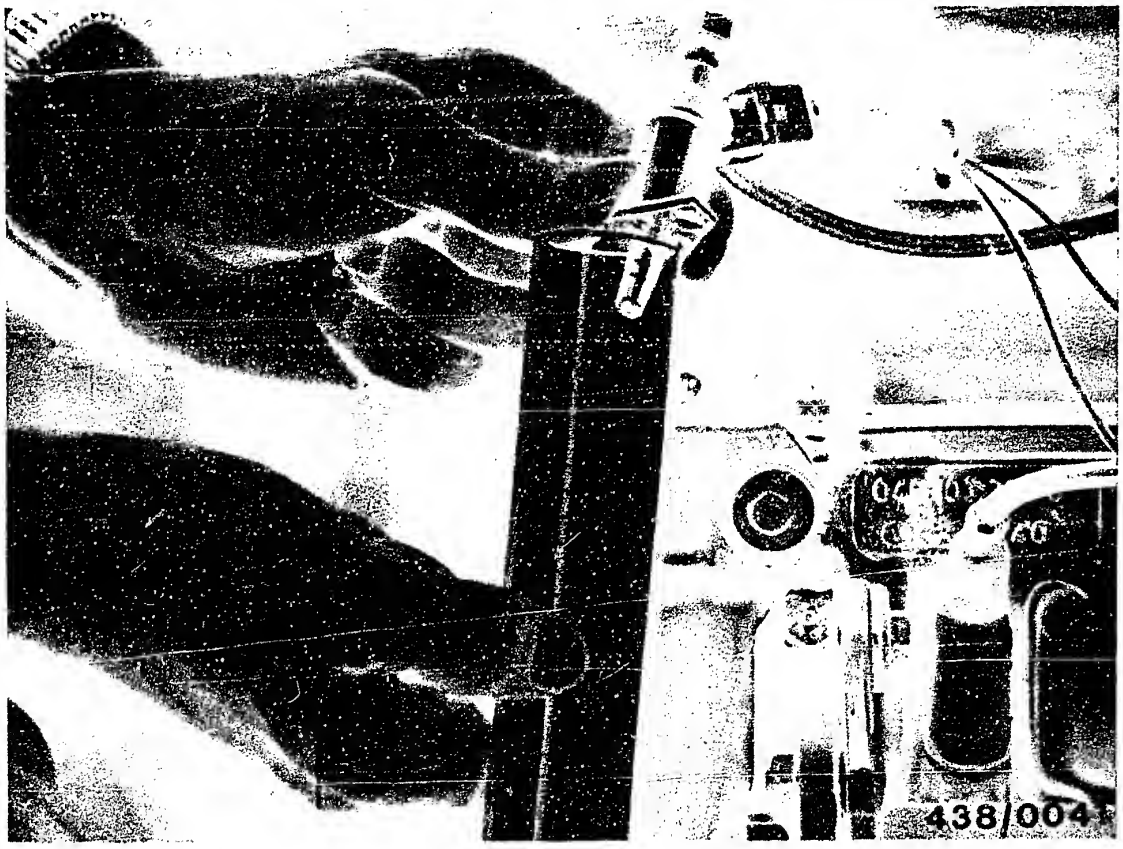
14.1 Thermo-time switch (not a Bosch product)

Pull off the plug.
Remove the thermo-time switch for testing.
Collect any escaping coolant in a container.



The switching temperature +15°C and the switching time at -20°C of 9,5 seconds are stamped into the hexagonal section of the thermo-time switch.
The removed thermo-time switch is tested using the ohmmeter in accordance with the specifications given below. The temperatures for the thermo-time switch can easily be obtained with water. Cooling takes place in a freezer chest.

At a temperature below °C	above °C	Resistance measurement (Ω) between Term. "G" and "ground" (housing)	Term. "W" and "ground" (housing)	Term. "G" and term. "W"
+10		40...60	0	40.. 60
	+20	50...70	240...300	180..240



14.2 Start valve

Remove the start valve. Connect a hose line instead of the steel tubing.
Pull off the plug and connect the start valve directly to ground and to terminal 15 (e.g. at the ignition coil) using connecting cable KDJE 7450/70.
Important note:
During this test, do not let the connecting cable touch B+. Danger of fire due to sparking!
Hold the start valve in a suitable container (e.g. the graduate).

Switch on the electric fuel pump by bridging the safety circuit.
Switch on the ignition (max. 30 seconds). The start valve must now open and spray fuel.

Switch off the ignition, remove the electric connecting cable and dry the nozzle of the start valve.
The safety circuit remains bridged so that the primary pressure is applied to the start valve.
No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.
Then switch the electric fuel pump off again.
Replace the start valve if it does not open or if it leaks.

If a leaky start valve or a defective thermo-time switch has been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinate F 18.

N. B. !

Never deflect the sensor plate (press it down) while the electric fuel pump is running. Otherwise fuel will be injected and subsequent operation of the starting motor can cause extremely serious damage to the engine!

15. Checking the control pressures

15.1 Preliminary remarks:

The control pressures which are to be checked below are basically determined by the warm-up regulator.
If the measurement result is incorrect, however, this may also be due to faults which have nothing to do with the warm-up regulator.

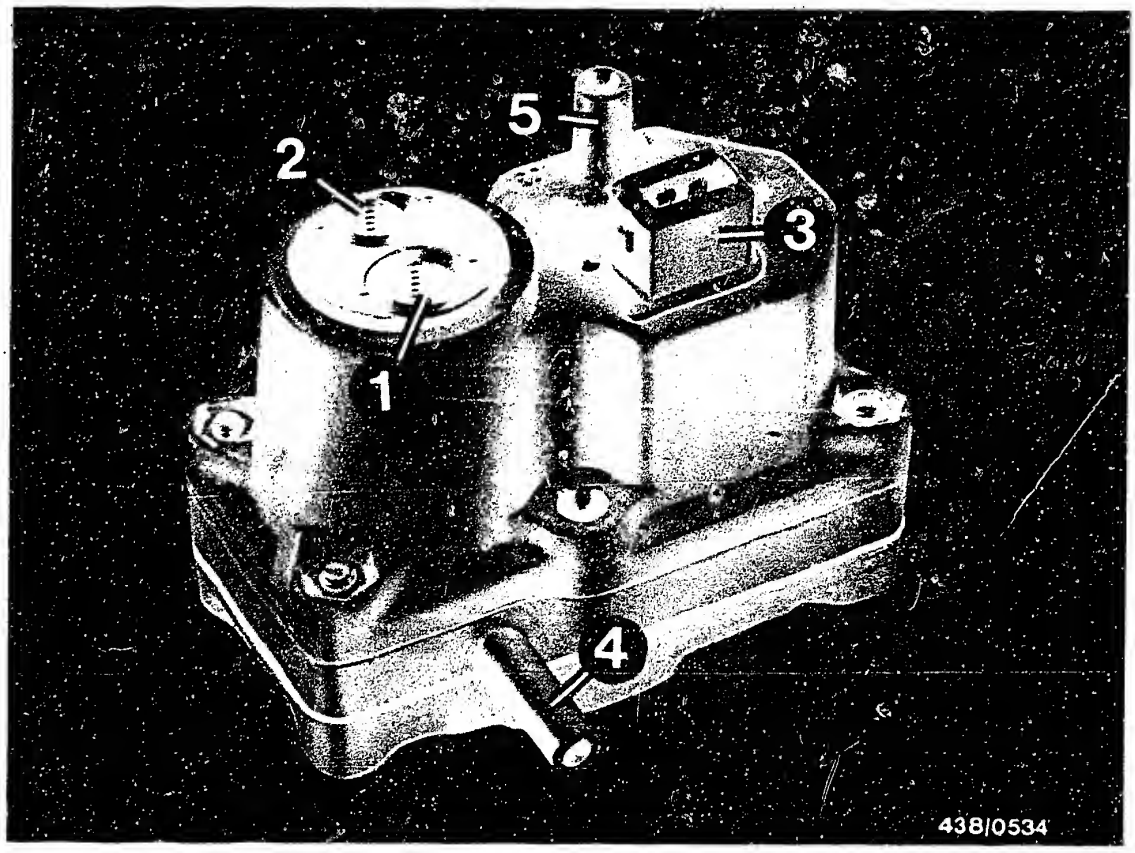
These possible faults are:

- No voltage across the electrical connector or voltage too low
- Fuel return from warm-up regulator blocked or constricted.
- Fuel delivery for the control-pressure circuit too low or too high.

The testing of this control-pressure delivery is described at the beginning of the control-pressure checks as an additional test step.

Test specification: 160 ... 240 cm^3/min

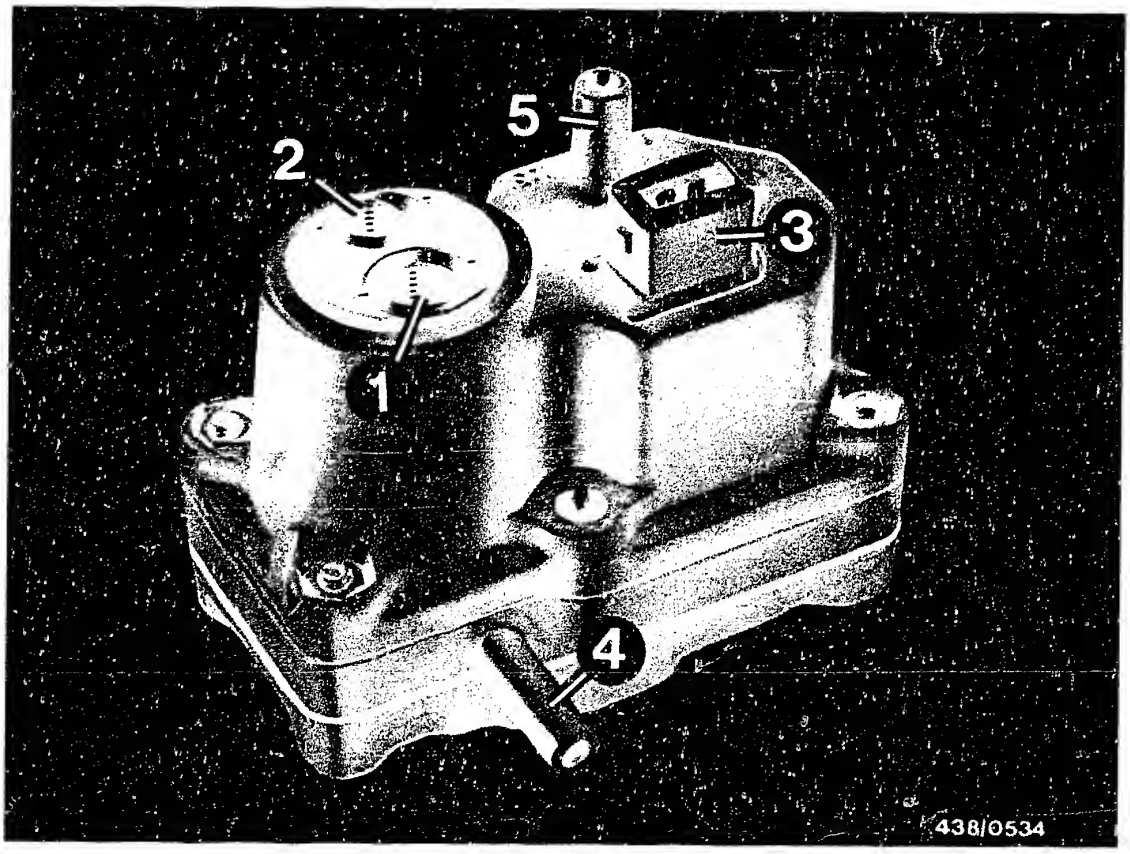
Reference is made to the other possible causes of trouble in the respective test step.



1 = Inlet connection (M 10 x 1)
2 = Return connection (M 8 x 1)
3 = Electric connection
4 = Connection for intake-manifold pressure (after throttle valve)
5 = Atmospheric connection (connection between air-flow sensor and trottle valve).

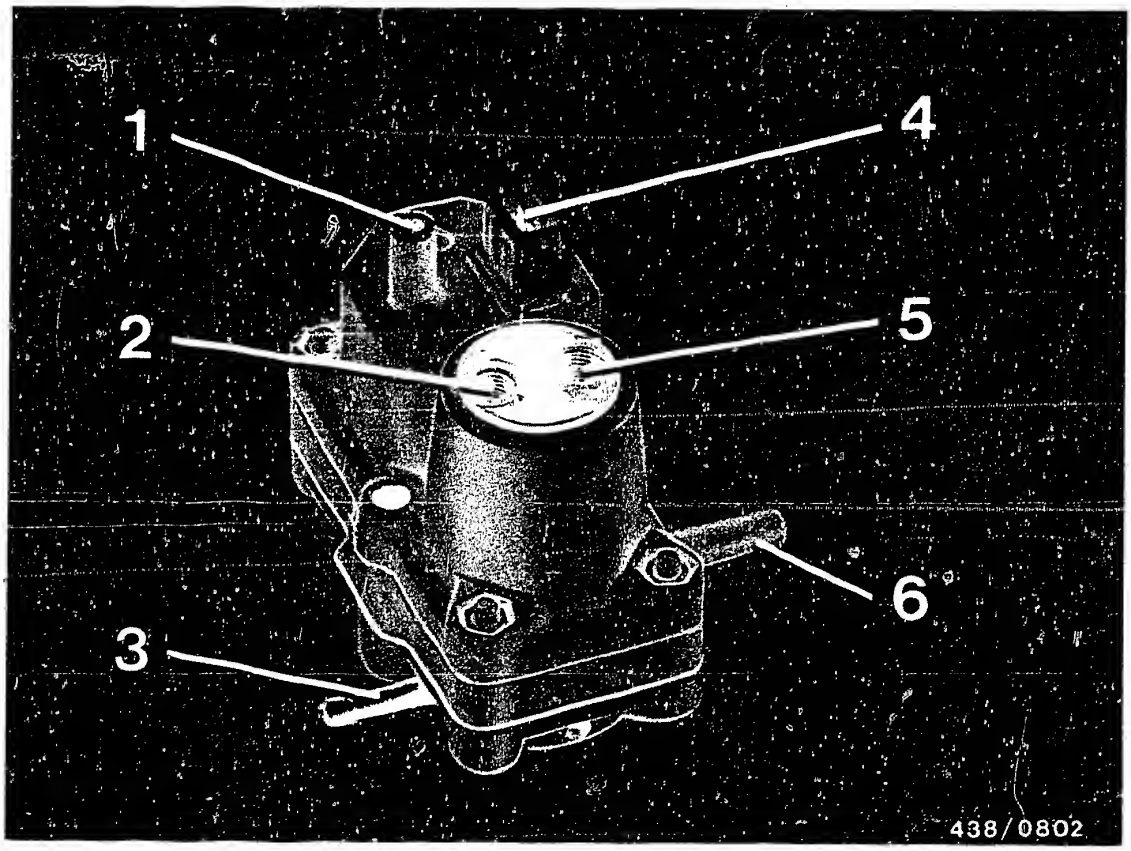
15.2 Warm-up regulator version — 0 438 140 061
0 438 140 134

- The warm-up regulator is a version for intake-manifold-pressure-controlled full-load enrichment. This means that the cold and warm control pressures are additionally influenced by the intake-manifold pressure acting on the full-load diaphragm of the warm-up regulator.



1 = Inlet connection (M 10 x 1)
2 = Return connection (M 8 x 1)
3 = Electric connection
4 = Connection for intake-manifold pressure (after throttle valve)
5 = Atmospheric connection (connection between air-flow sensor and throttle valve).

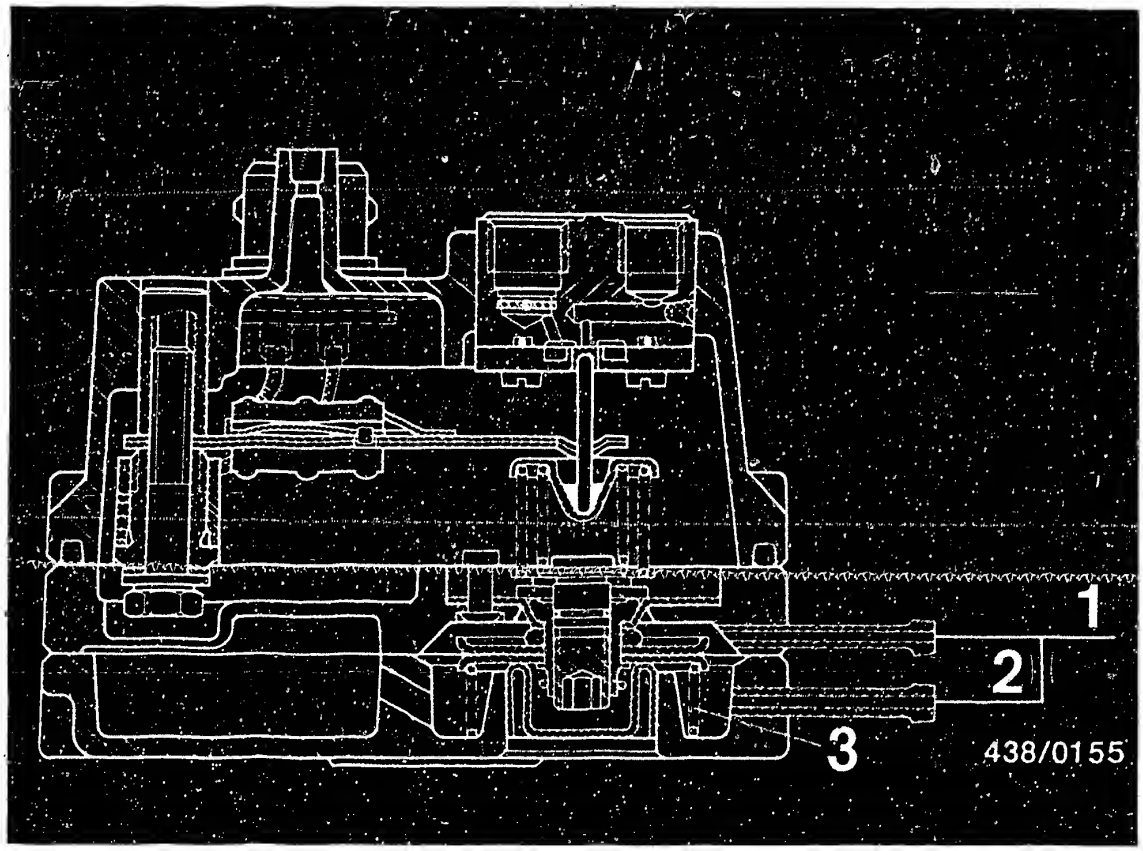
The intake-manifold-pressure connection port (4) is located on the intermediate plate. On the top of the housing cover there is a connection pipe for atmospheric pressure (connection to the engine before the throttle valve)(5).



1 = Atmospheric connection
2 = Return connection (M 8 x 1)
3 = Connection for fixed restriction
4 = Electric connection
5 = Inlet connection (M 10 x 1)
6 = Connection for intake-manifold pressure (after throttle valve)

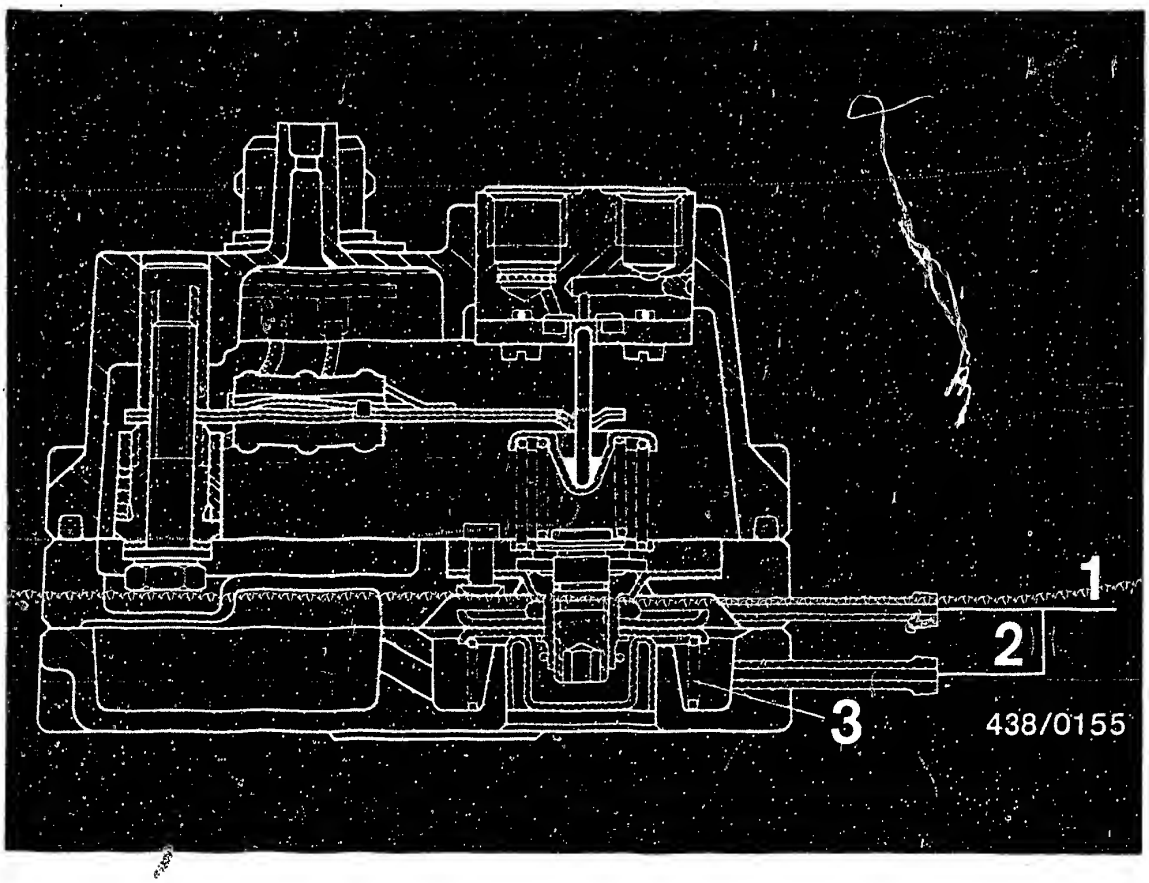
- Version of warm-up regulator 0 438 140 101

The warm-up regulator is a version for acceleration enrichment. This means that the cold and warm control pressures are additionally influenced by the intake-manifold pressure acting on the acceleration diaphragm of the warm-up regulator.



1 = Intake-manifold-pressure connection port
2 = Restriction (fixed restriction)
3 = Helical compression spring

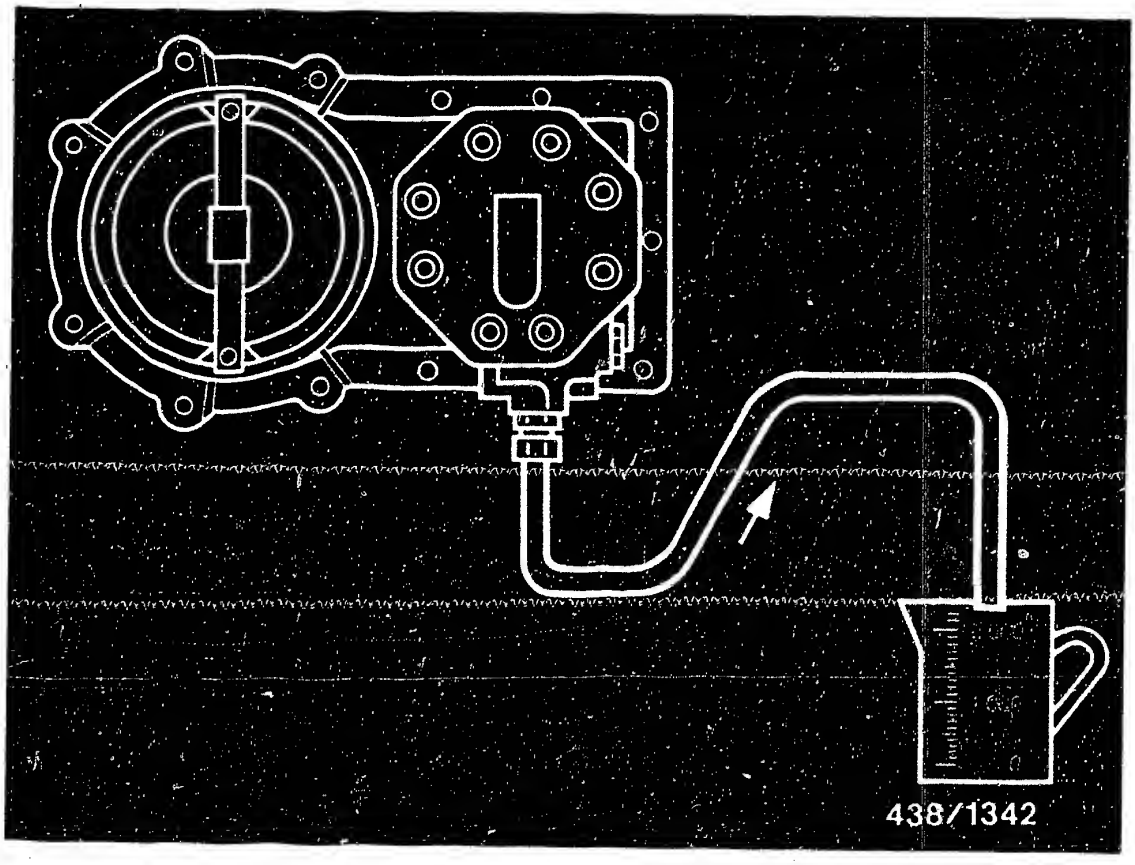
●Operation: The construction of the warm-up regulator is largely the same as the version for full-load enrichment. The bottom part of the housing has an additional helical compression spring (3) which forces the diaphragm assembly against the upper stop. The action of the additional spring regulates the normal control pressure with the position of the throttle valve constant (3.6 bar gauge pressure with the warm-up regulator shut off).



1 = Intake-manifold-pressure connection port
2 = Restriction (fixed restriction)
3 = Helical compression spring

During acceleration there is a rapid pressure rise in the upper chamber while the pressure rises slowly in the lower chamber.
While there is this difference in pressure the diaphragm is forced against the lower stop by the force of the spring (3) and thus the control pressure is reduced to a given value for a richer mixture.

Important note:
The fixed restriction must not be exchanged, and the hose line between the fixed restriction and the lower chamber of the warm-up regulator must not be shortened or exchanged for hose lines of other dimensions.

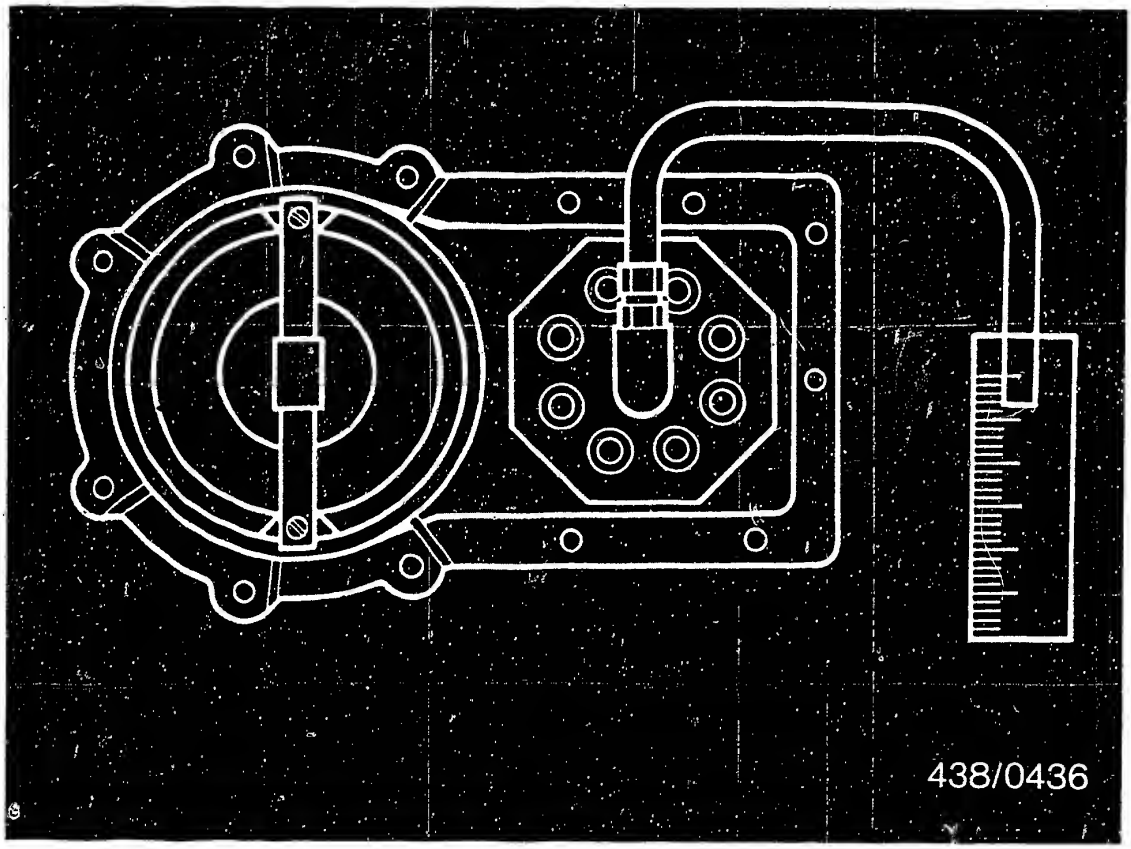


15.3 Checking the fuel delivery for the control-pressure circuit

Before testing, make sure that the electric fuel pump is operating properly.

Test specification
3.8 l engine: at least 1000 cm^3/30 s
5.0 l engine: at least 1100 cm^3/30 s

Connect the test hose to the testing point using an M 14 x 1.5 union nut. Connect the return line to the fuel distributor.



Unscrew the control-pressure line (to warm-up regulator) from the fuel distributor.

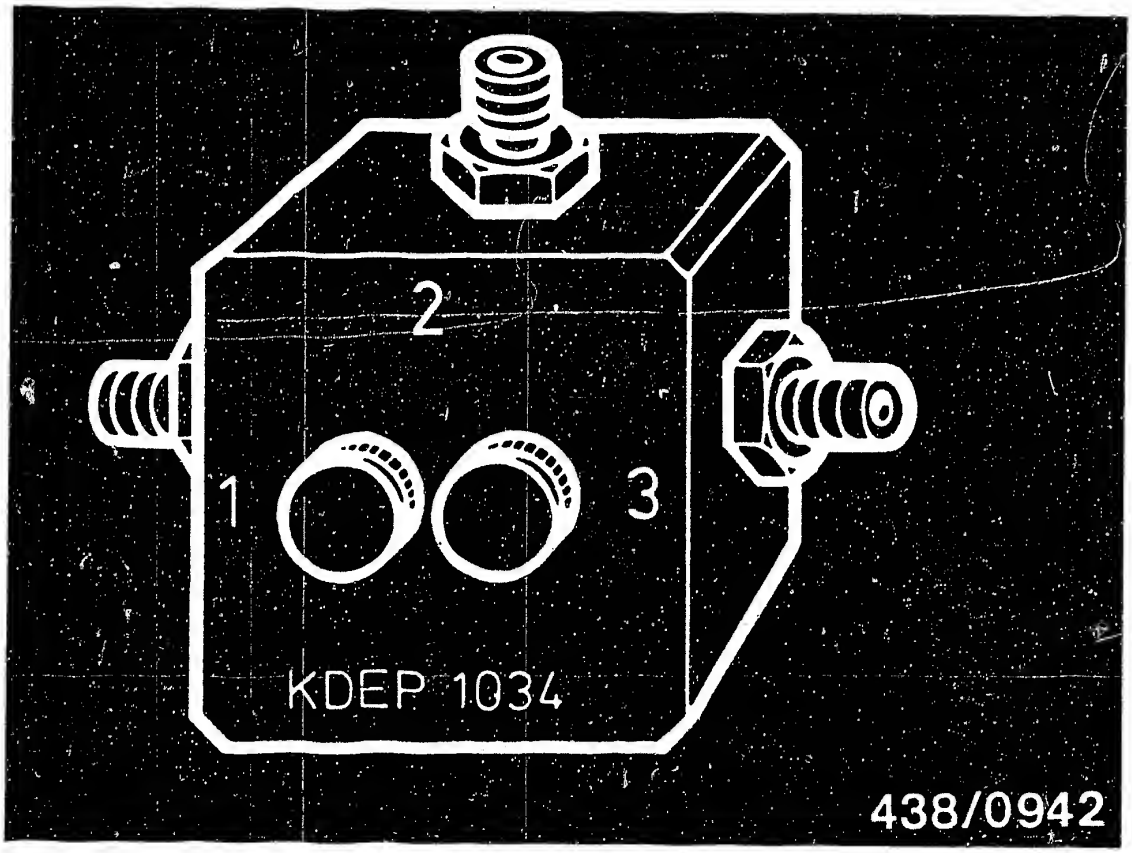
Connect the connecting hose KDJE-P 100/11/1 (formerly KDEP 1034/11/1) of the pressure tester to the control-pressure port of the fuel distributor and hold hose in graduate (approx. 0.5 litre capacity).

Switch on the electric fuel pump for 1 minute by bridging the safety circuit.
Measure delivery.

Test specification: 160...240 cm^3/min.

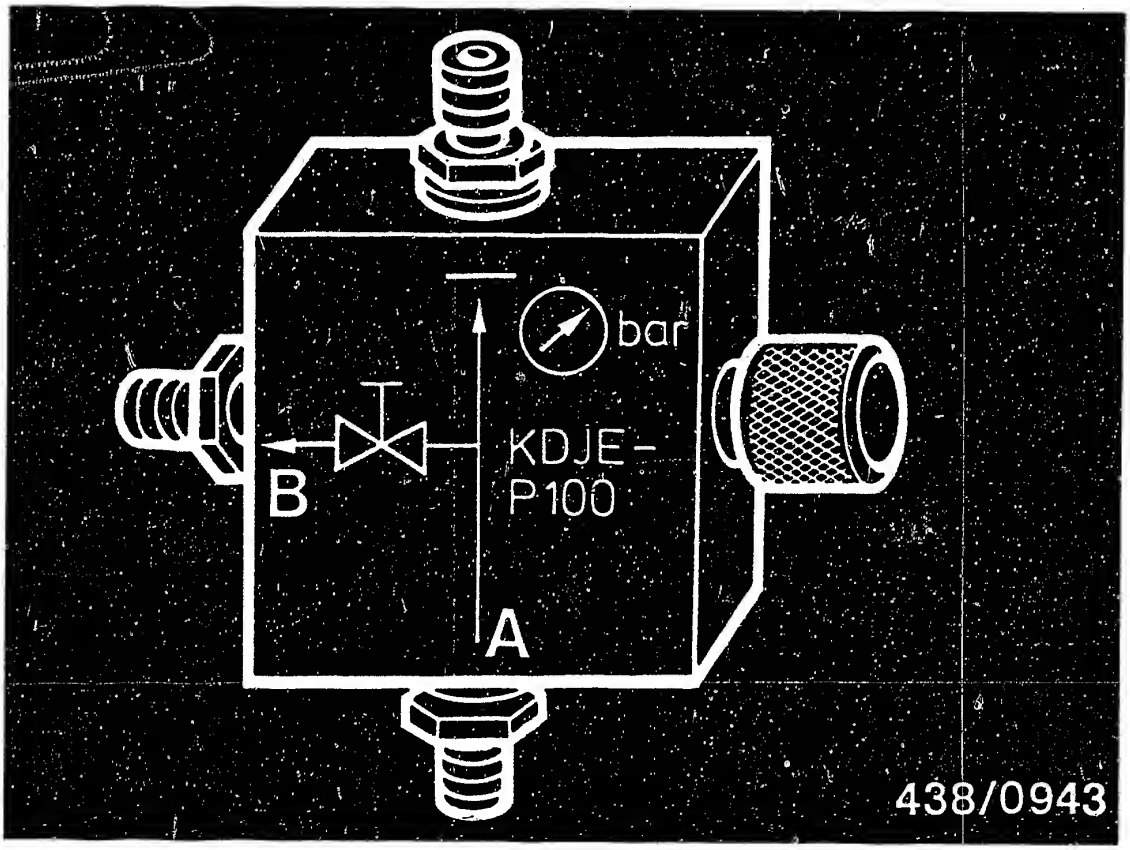
If the measured value is outside tolerance, the fault is in the fuel distributor.

Replace the fuel distributor.



15.4 Mounting the pressure tester KDJE-P100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered.

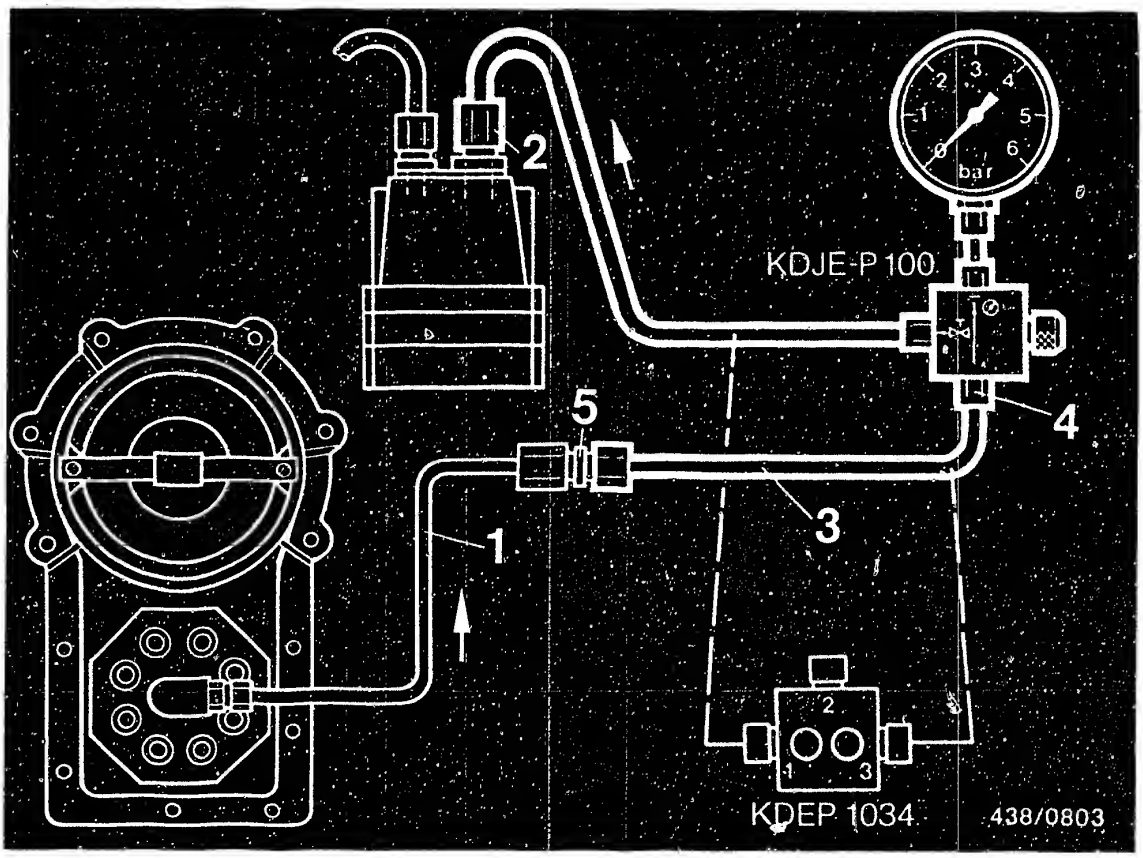


Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw.

The connections of this directional control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

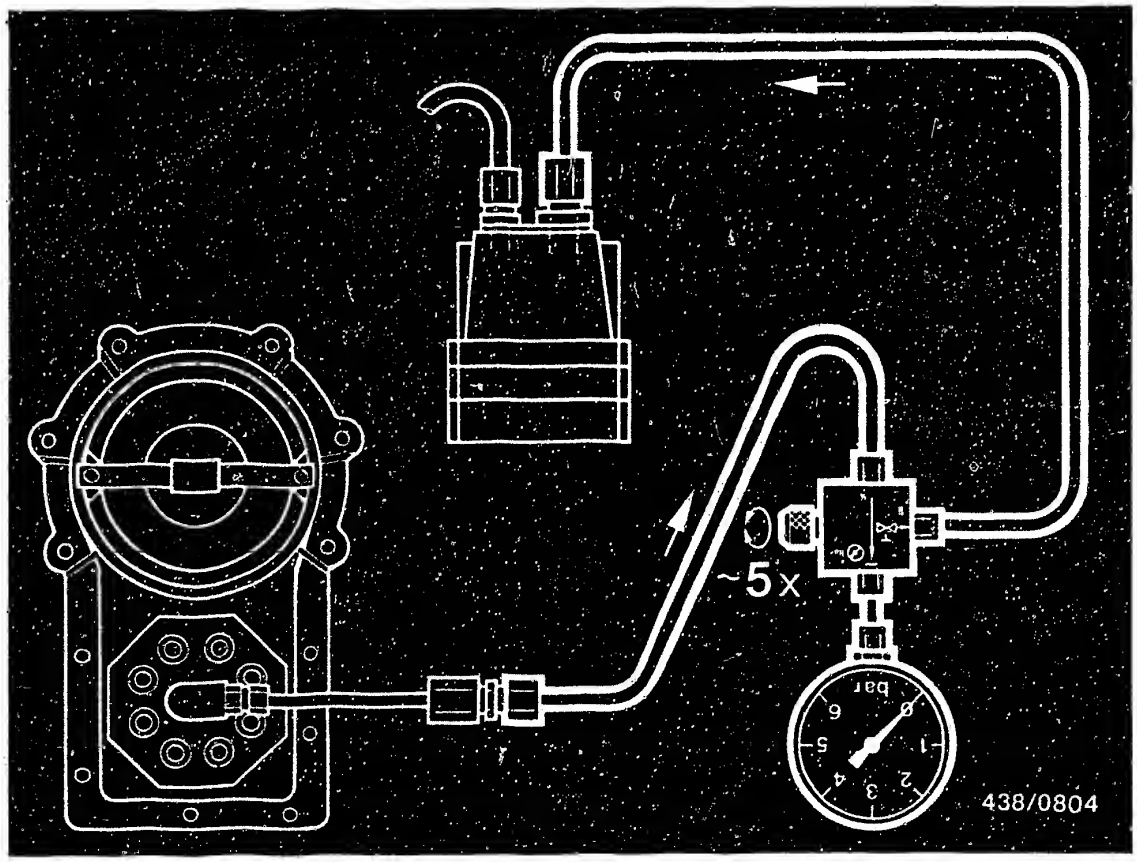
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.
Fit using connecting-parts set KDJE-P 100/11.

Unscrew the control-pressure line (1) on the warm-up regulator. Connect the end of the hose (2) of the directional-control valve to the warm-up regulator inlet.
Connect the connecting hose KDJE-P 100/11/1 (3) to the inlet fitting (4) of the directional-control valve.
Screw the double fitting (5) into the connecting hose and connect to control-pressure line (1).

Steel control-pressure line must not be kinked!
Suspend the pressure gauge from the engine-compartment lid.



15.5 Bleeding the pressure tester

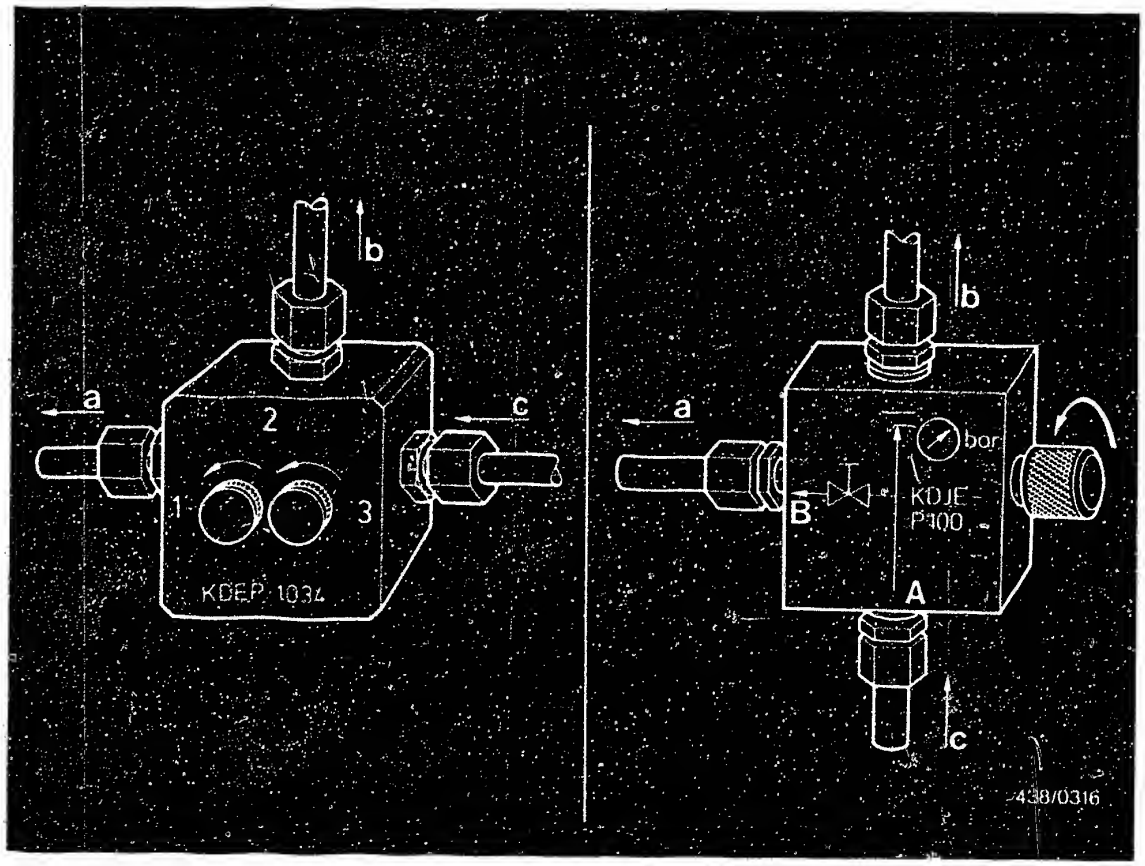
Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).

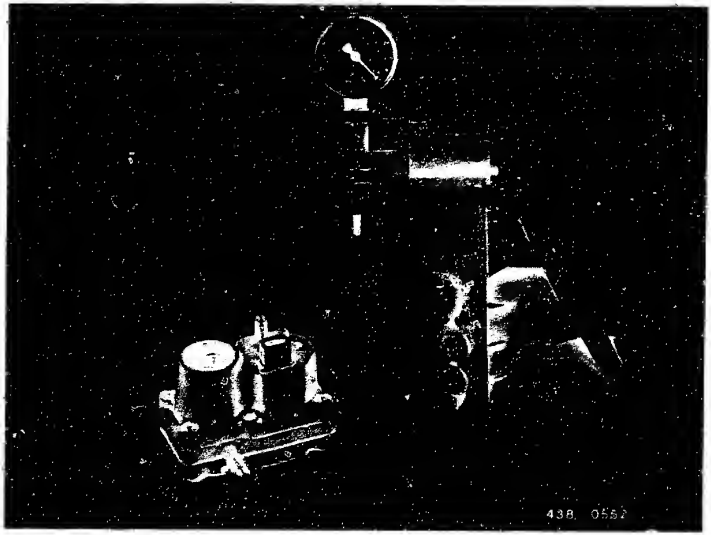


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

15.6 Testing the "cold" control pressure:

- Warm-up regulator: 0 438 140 061
  0 438 140 101
  0 438 140 134

The test is performed with the engine switched off.
The engine must be cold. For this purpose, the engine should have been switched off for several hours, preferably overnight.
Pull off the plug from the warm-up regulator.
Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).
Switch on the electric fuel pump by bridging the electrical safety circuit.

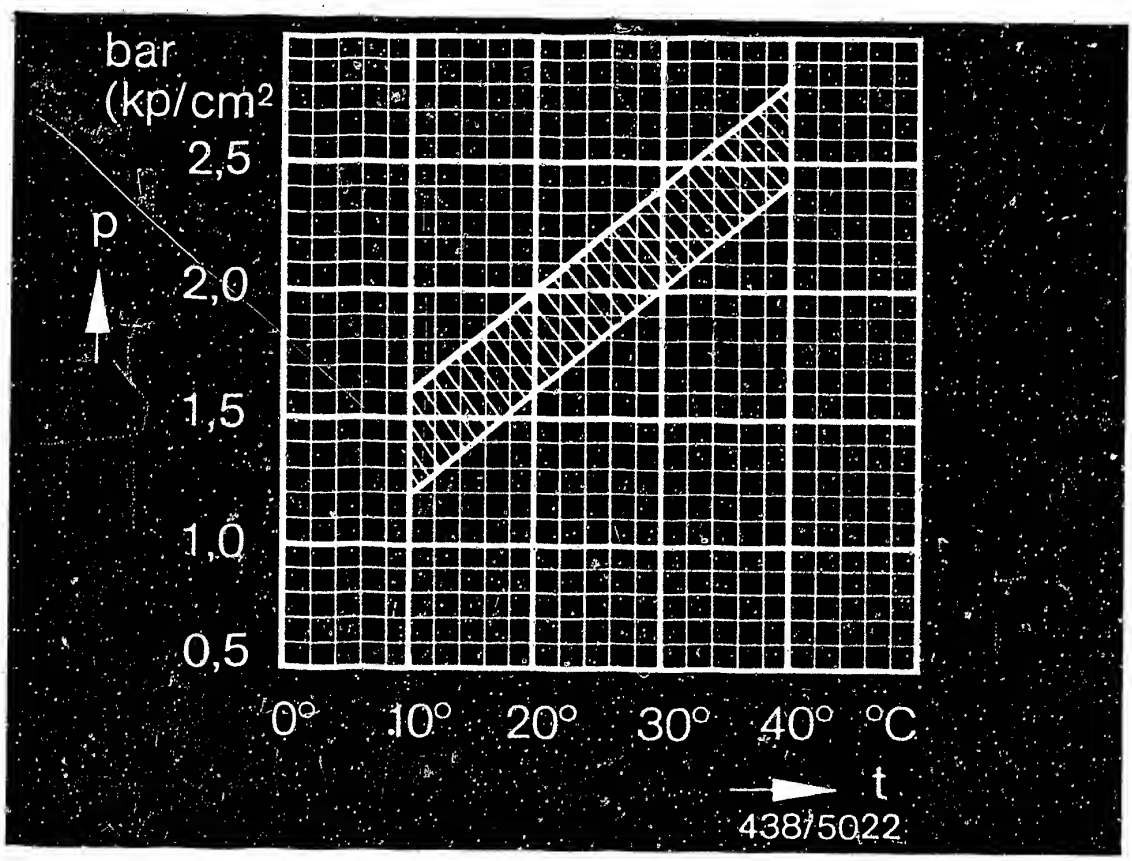


Part no. of warm-up regulator: 0 438 140 061
0 438 140 134

The control pressure is checked with simulated intake-manifold pressure, i.e. vacuum is applied to the warm-up regulator.
To do this, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator on the intermediate plate of the housing. The picture shows testing with the recommended Mityvac hand vacuum pump.

Setting value for testing: 400...600 mbar
(300...450 mmHg)

The "cold" control pressure is indicated on the pressure gauge of the pressure tester.



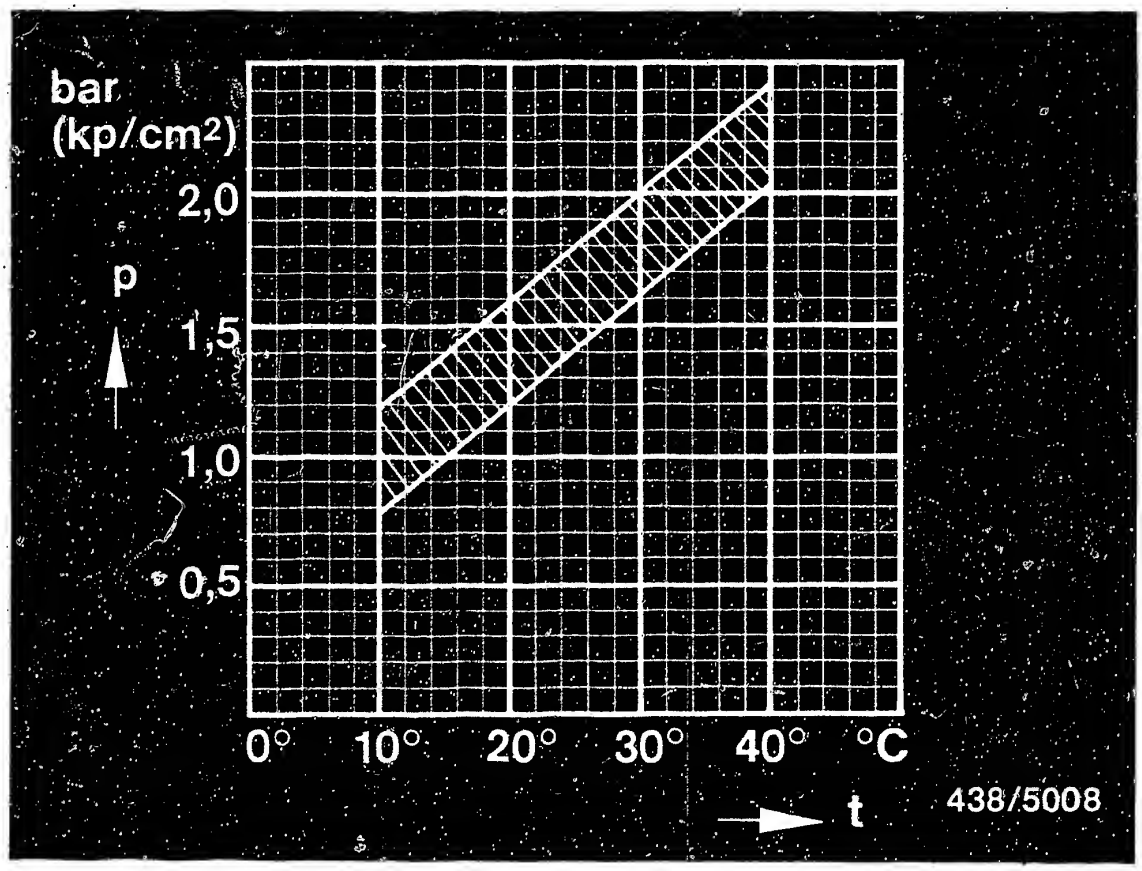
p = Control pressure (gauge pressure)
t = Ambient temperature

- Warm-up regulator 0 438 140 061

(Model for full-load enrichment controlled by intake manifold pressure)
To check, connect a vacuum pump to the intake manifold pressure connection of the warm-up regulator.

Setting value: 400...600 mbar
(300...450 mmHg)

Obtain the specified value for control pressure from the diagram corresponding to the ambient temperature.
Example: Ambient temperature = +20°C
Specified control pressure = 1.6...2.0 bar (gauge pressure)

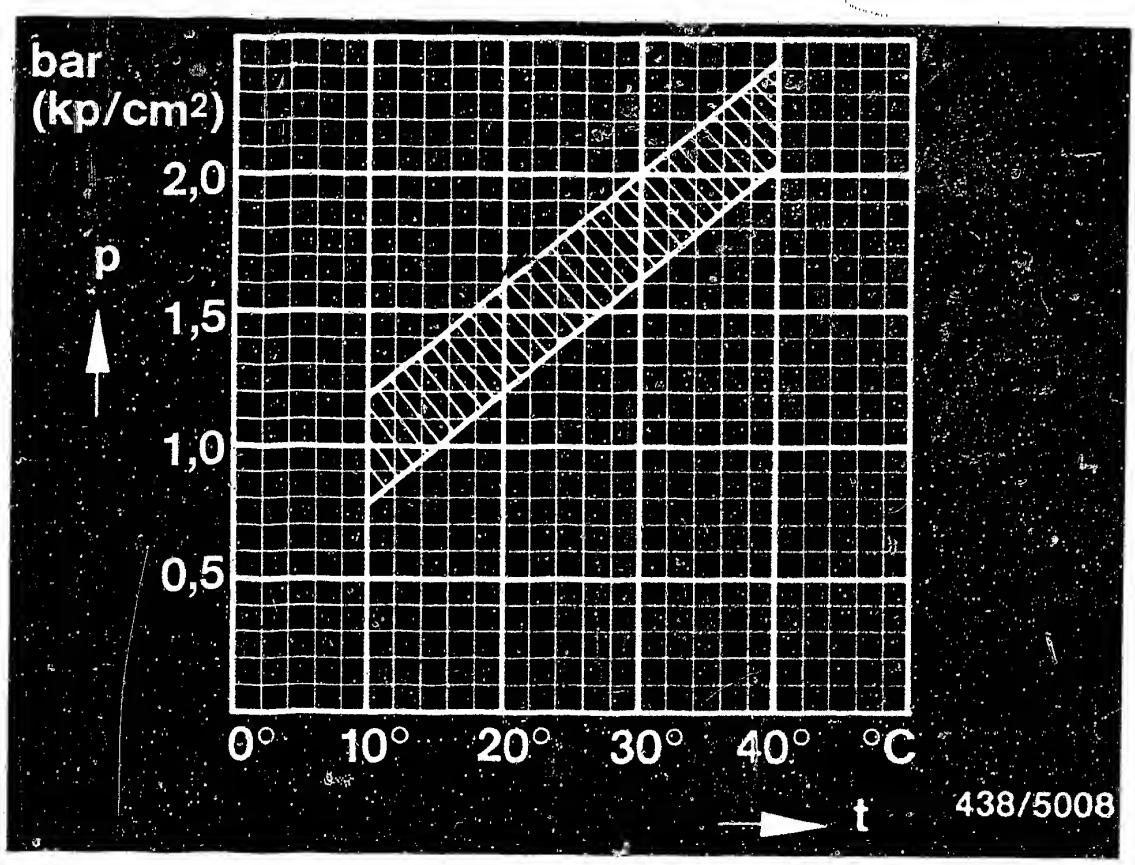


p = Control pressure (bar or kgf/cm² gauge pressure)
t = Ambient temperature (°C)

- Warm-up regulator 0 438 140 101 up to FD 344
  (Model for acceleration enrichment)
  Test with engine at standstill, i.e. with no intake manifold pressure

Obtain the specified value for control pressure from the diagram corresponding to the ambient temperature.

Example: Ambient temperature = +20°C
Specified control pressure = 1.2...1.6 bar (gauge pressure)



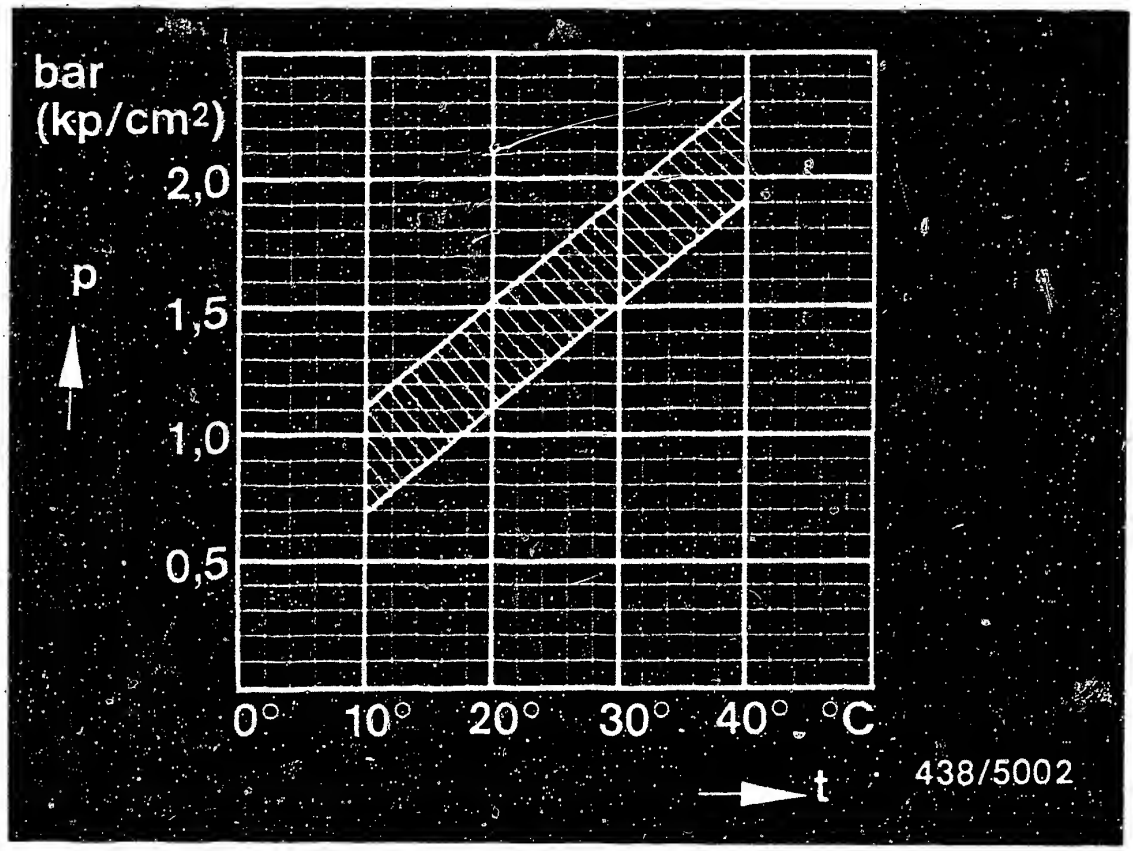
p = Control pressure (bar or kgf/cm² gauge pressure)
t = Ambient temperature (°C)

- Warm-up regulator-part number: 0 438 140 134
  (Model for full-load enrichment controlled by intake manifold pressure)
  To check, connect a vacuum pump to the intake manifold pressure connection on the warm-up regulator.

Setting value: 400 ... 600 mbar
(300...450 mmHg)

Obtain the specified value for control pressure from the diagram to correspond to the ambient temperature.

Example: Ambient temperature = +20°C
Specified control pressure = 1.2...1.6 bar gauge pressure



p = Control pressure (gauge pressure)
t = Ambient pressure

- Warm-up regulator 0 438 140 101 as of FD 345
  (Model for acceleration enrichment)

Test with engine at standstill, i.e., no intake manifold pressure.

Obtain the specified value for control pressure from the diagram to correspond to the ambient temperature.

Example: Ambient temperature = +20°C
Specified control pressure = 1,1...1,5 bar gauge pressure

If the measured "cold" control pressure differs from the test specification, this may be due to one of the following faults:

- Fuel delivery for the control-pressure circuit too low or too high. Test fuel delivery. Test specification: 160...240 cm^3/min.

- Fuel return from the warm-up regulator blocked or constricted (if control pressure too high).
Eliminate constriction.

- Warm-up regulator defective. Replace warm-up regulator.
If the warm-up regulator has failed due to fouling, the new warm-up regulator must be provided with tube fitting 1 433 356 802. Tightening torque 20...22 Nm (2.0...2.2 kgfm).

When the warm-up regulator has been replaced or a fault remedied, carry out the idle adjustment with the engine at normal operating temperature.

Idle adjustment is described on Coordinate F 18.

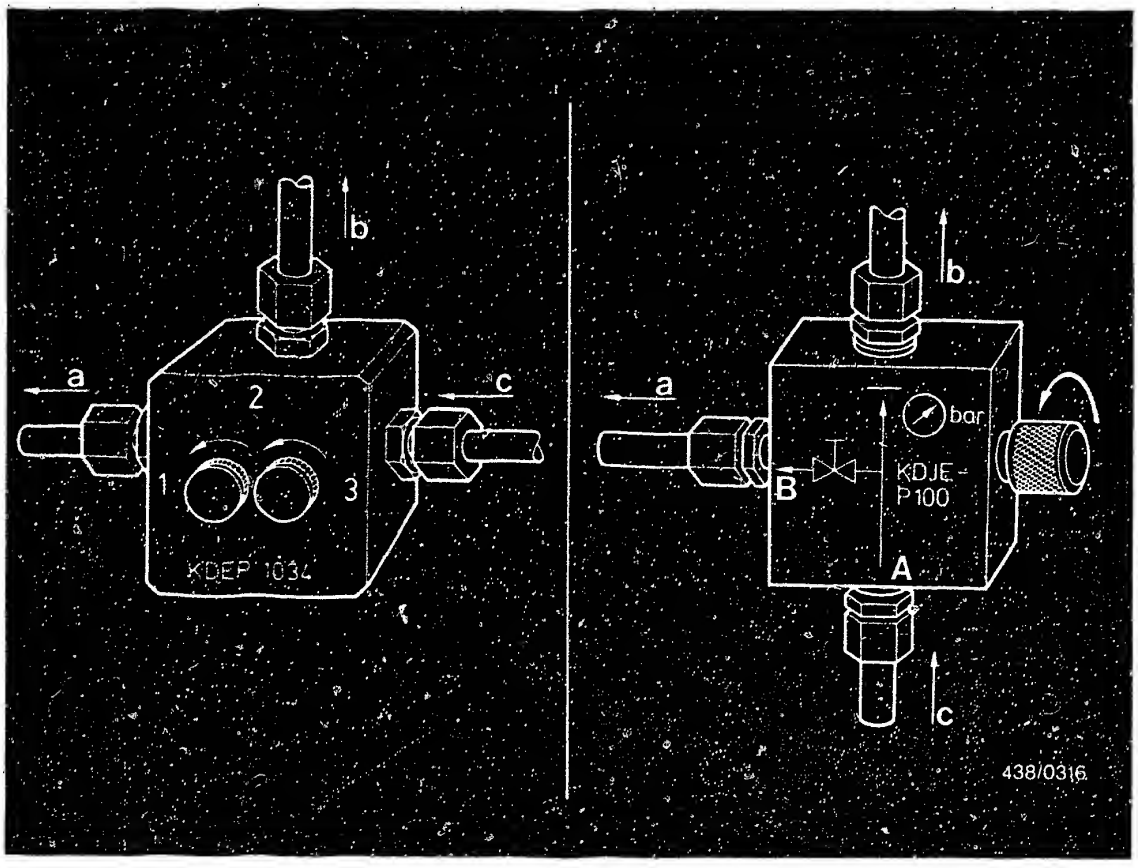
Note:

The above-described control-pressure test tells you whether the control-pressure circuit and warm-up regulator are O.K.

Incorrect control-pressure functions during vehicle operation may, however, also be due to a malfunction in the manifold pressure control system for the warm-up regulator.

This system must be tested with the engine at normal operating temperature and running. Therefore, it is best to combine the test with the final idle adjustment.

Idle adjustment is described on Coordinate F 18.



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

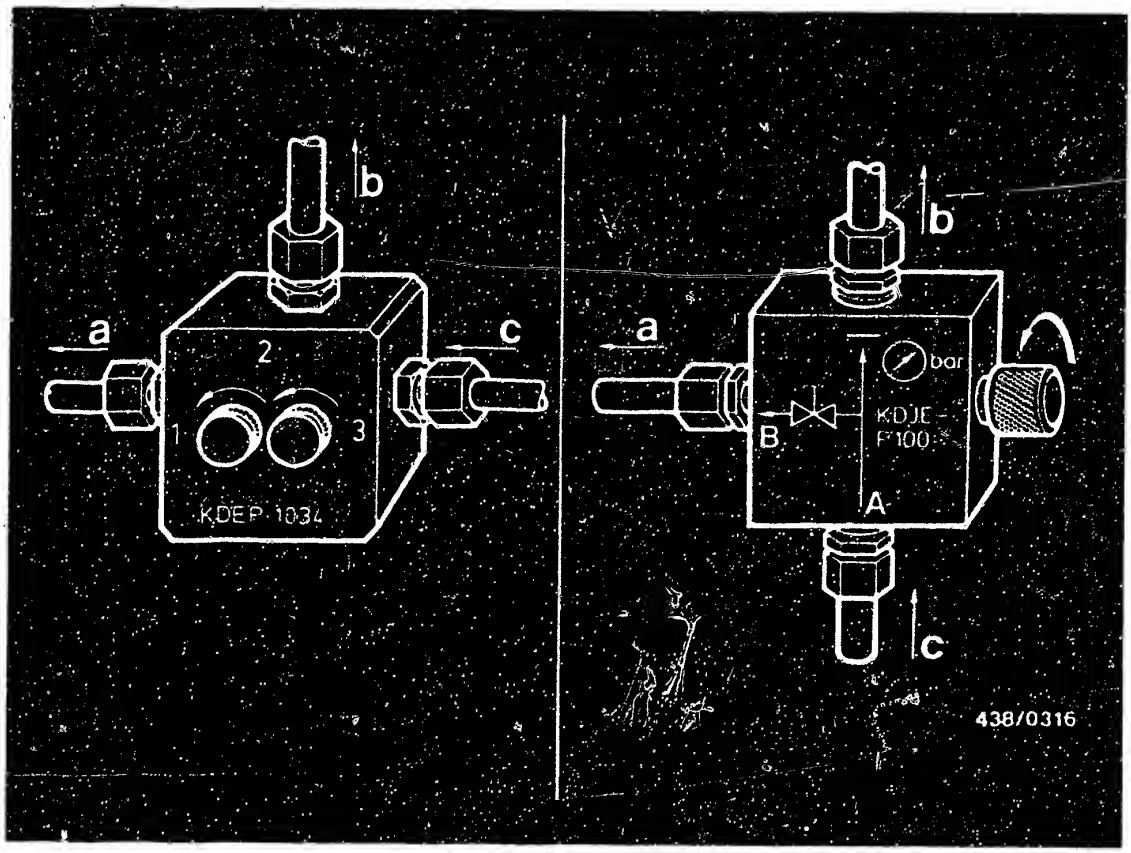
15.7 Checking the "warm" control pressure

Warm-up regulator Part No.: 0 438 140 101

Checking is done with engine at standstill, once at atmospheric pressure, once at simulated intake manifold vacuum on the lower chamber.

The test is performed with the engine switched off, once without intake-manifold pressure being applied, once with simulated intake-manifold pressure (vacuum) applied.

Open the valve screw of the directional-control valve (or both valves in the case of KDEP 1034).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

- Warm-up regulator Part.Nr.: 0 438 140 061
  0 438 140 134

The test is performed with the engine switched off, once <u>without</u> intake-manifold pressure being applied, once <u>with</u> simulated intake-manifold pressure (vacuum) applied.

Open the valve screw of the directional-control valve (or both valves in the case of KDEP 1034).

15.8 Test with atmospheric pressure

The temperature of the engine is not important.

Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Attach the plug to the warm-up regulator.

Control pressure now rises (the warm-up regulator in the process of shutting off) until the "warm" control pressure is reached.

The "warm" control pressure is indicated on the pressure gauge of the pressure tester.

Test specification for "warm" control pressure (with atmospheric pressure), i.e. with the engine switched off

- Warm-up regulators

0 438 140 061	up to FD 341	3.0...3.4 bar gauge press.
	after FD 342	2.6...3.0 bar gauge press.
0 438 140 101		3.4...3.8 bar gauge press.
0 438 140 134		2.6...3.0 bar gauge press.

If the measured "cold" control pressure differs from the nominal value, this may be due to one of the following faults:

If control pressure too high:

- Fuel delivery for the control-pressure circuit too high. Test fuel delivery.
  Test specification: 160...240 cm^3/min.

  If the value measured is not within tolerance, take out and replace the fuel distributor.

- Fuel return from the warm-up regulator blocked or constricted. Eliminate constriction.

- Warm-up regulator defective (hydraulic defect).
  Replace warm-up regulator.

If the warm-up regulator has failed due to fouling, the new warm-up regulator should be provided with tube fitting 1 433 356 802. Tightening torque 20...22 N m (2.0...2.2 kgfm).

If control pressure too low:

- Power-supply open circuit.
  Eliminate open circuit. Ensure that the plug is contacting properly.

- Battery voltage too low, voltage drop.
  Eliminate voltage drop. Minimum voltage at connector: 11.5 V.
  If necessary, repeat test with engine running in order to obtain the normal generator voltage of approx. 14 V when the vehicle is in operation.

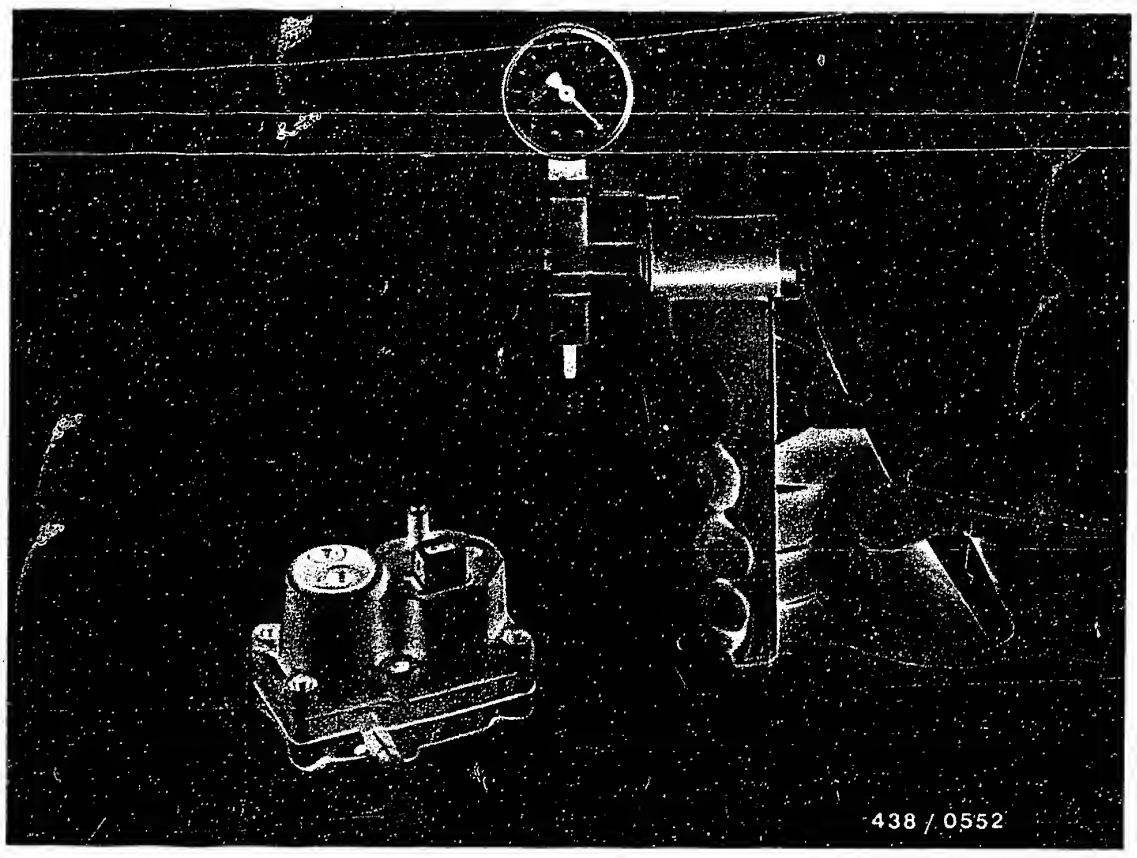
- Fuel delivery for the control-pressure circuit too low. Test fuel delivery.
  Test value: 160...240 cm^3/min.

  If the value measured is not within tolerance, take out and replace the fuel distributor.

- Warm-up regulator defective. Heating coil open-circuit. Hydraulic defect. Replace warm-up regulator.

When the warm-up regulator has been replaced or a fault remedies, carry out the idle adjustment with the engine at normal operating temperature.

Idle adjustment is described on Coordinates F 18.



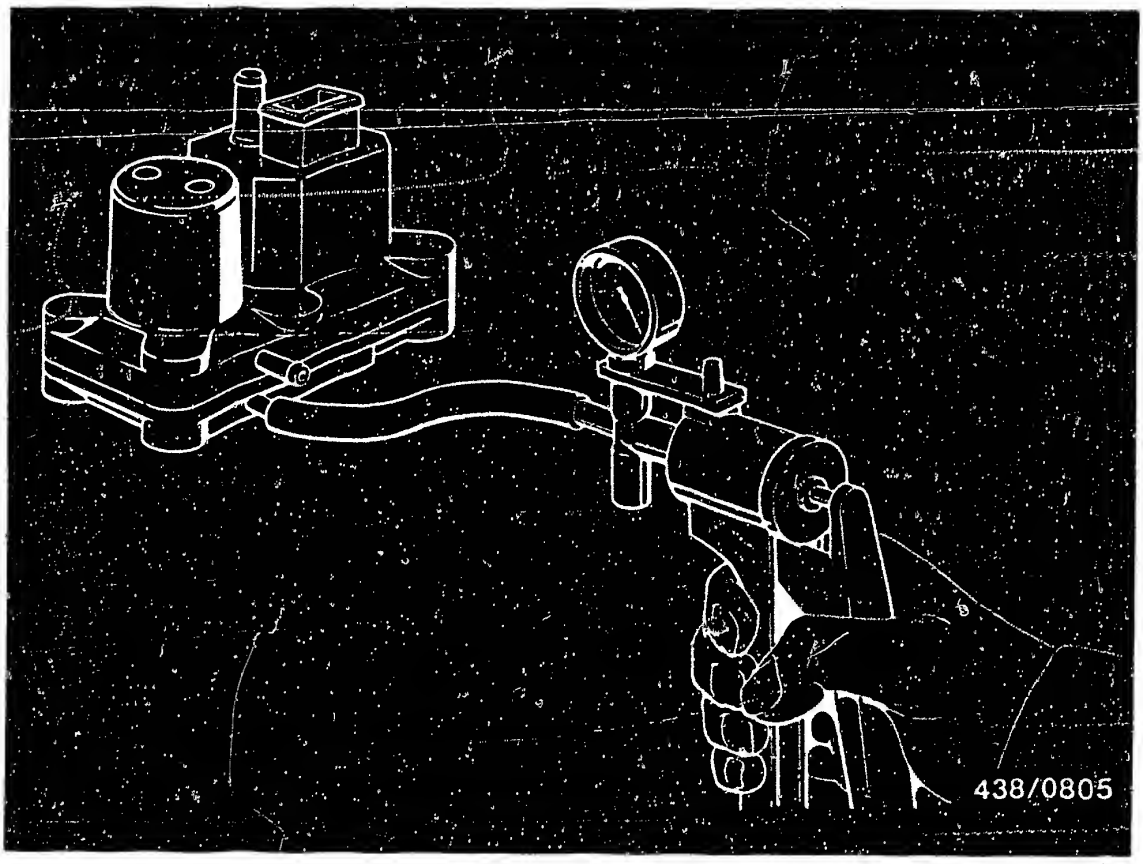
15.9 Test procedure with vacuum

- Warm-up regulators 0 438 140 061
  0 438 140 134

For testing with simulated intake-manifold pressure, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator (in the intermediate plate of the housing).

The picture shows the recommended Mityvac hand pump.

Setting value for the test: 400...600 mbar
(300...450 torr)



- Warm-up regulators 0 438 140 101

In order to test the acceleration enrichment control pressure, vacuum must be applied to the warm-up regulator.

The electric fuel pump remains switched on; the electric connector on the warm-up regulator remains plugged on.

Connect "Mityvac" hand vacuum pump to the intake-manifold pressure connection port of the lower chamber of the warm-up regulator and build up a vacuum.
Setting value: 400...600 mbar
(300...450 mmHg).

Test procedure

- The temperature of the engine is not important.
- Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).
- Switch on the electric fuel pump by bridging the electrical safety circuit.
- Attach the plug to the warm-up regulator.

Control pressure now rises (the warm-up regulator in the process of shutting off) until the "warm" control pressure is reached.

The "warm" control pressure is indicated on the pressure gauge of the pressure tester.

Test specification for "warm" control pressure (with atmospheric pressure), i.e. with the engine switched off:

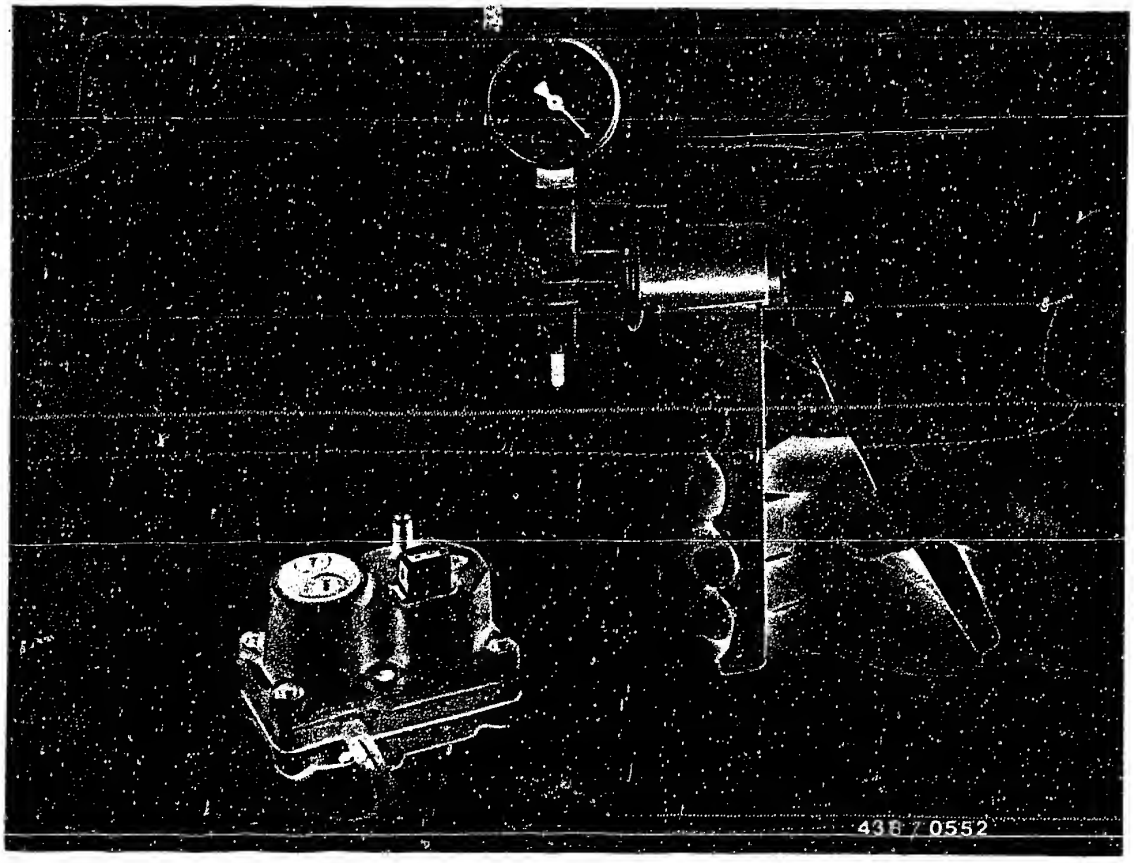
- Connect a vacuum pump to the intake manifold pressure connection.
  Setting value: 400...600 mbar (300...450 mmHg)

Warm-up regulators	
0 438 140 061	3.4...3.8 bar gauge pressure
0 438 140 101	2.6...3.0 bar gauge pressure
0 438 140 134	3.4...3.8 bar gauge pressure

If the "warm" control pressure as measured deviates from the test specification, take out and replace the warm-up regulator.

If the warm-up regulator has been taken out and replaced, or if a defect has been eliminated, finish by adjusting the idle with the engine at normal operating temperature.

Idle adjustment has been described at coordinates F 18.



15.10 Leaks

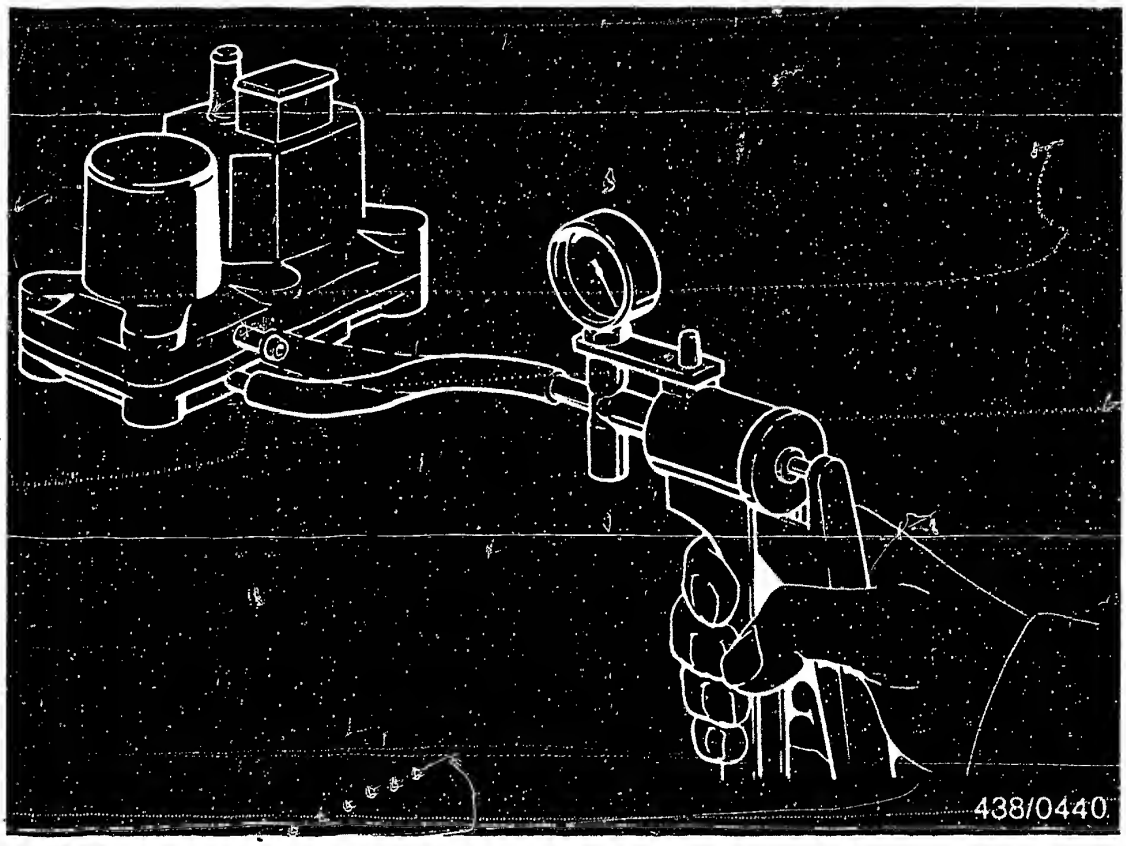
- Checking the full-load diaphragm for leaks
  Warm-up regulators 0 438 140 061
  0 438 140 134

Switch off the electric fuel pump.

Connect the "Mityvac" hand vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator and build up a vacuum.
Setting value: 400...600 mbar (300..450 mmHg)

Test specification for air leaks:
Max. pressure drop within 15 s 100 mbar (75 mmHg)

If the pressure drop is too great, replace the warm-up regulator.



- Checking the two acceleration enrichment chambers for leaks

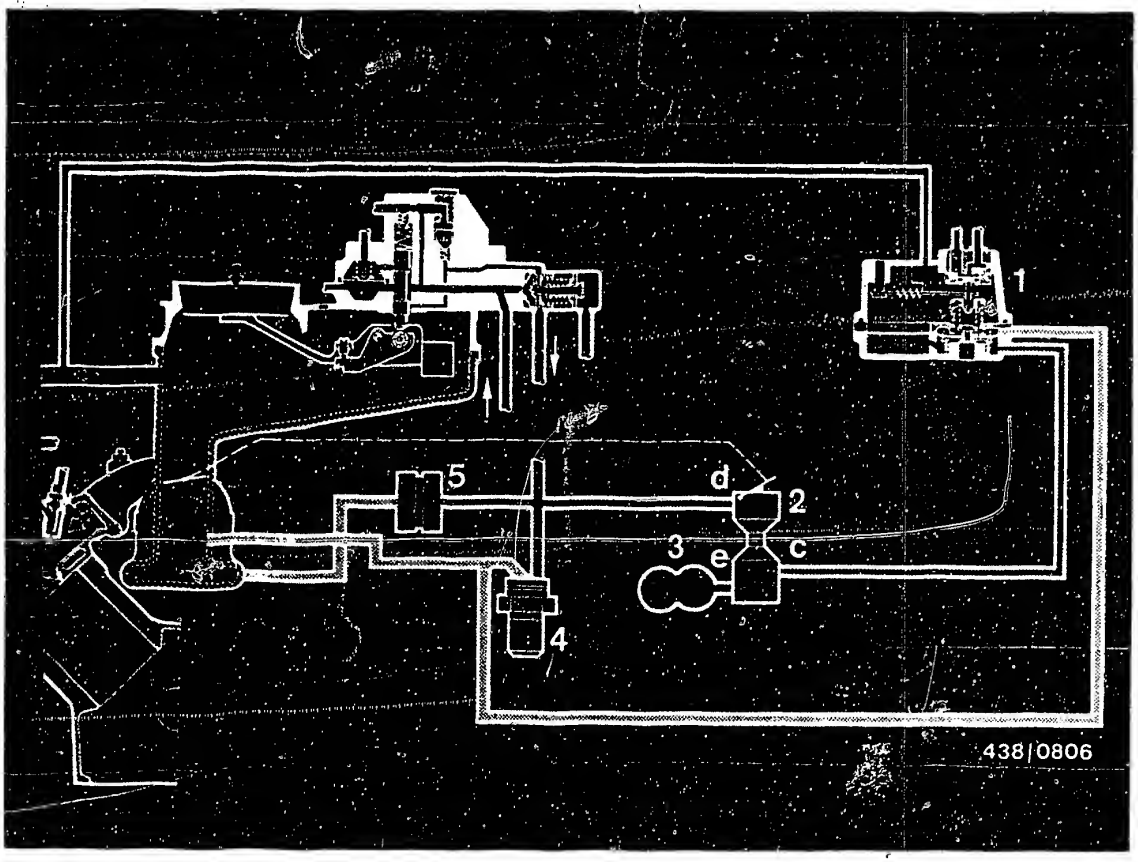
Warm-up regulator 0 438 140 101

Switch off the electric fuel pump.

Connect the "Mityvac" hand vacuum pump to the intake-manifold-pressure connection port on the lower chamber, and then to the upper chamber, and build up a vacuum. Setting value: 400...600 mbar (300...450 torr).

Test specification for air leaks on both chambers: Max. pressure drop within 15 sec. 100 mbar (75 torr). If the pressure drop is too high, replace the warm-up regulator.

When the warm-up regulator has been replaced or a fault in the control-pressure circuit remedied, carry out the idle adjustment with the engine at normal operating temperature.
Idle adjustment is described on Coordinate F 18.



Engine temperature below 50 °C, thermo-valve closed.

Directly acting vacuum

Delayed acting vacuum through restriction

15.11 Checking the intake-manifold pressure control of the warm-up regulator 0 438 140 101

Operation:

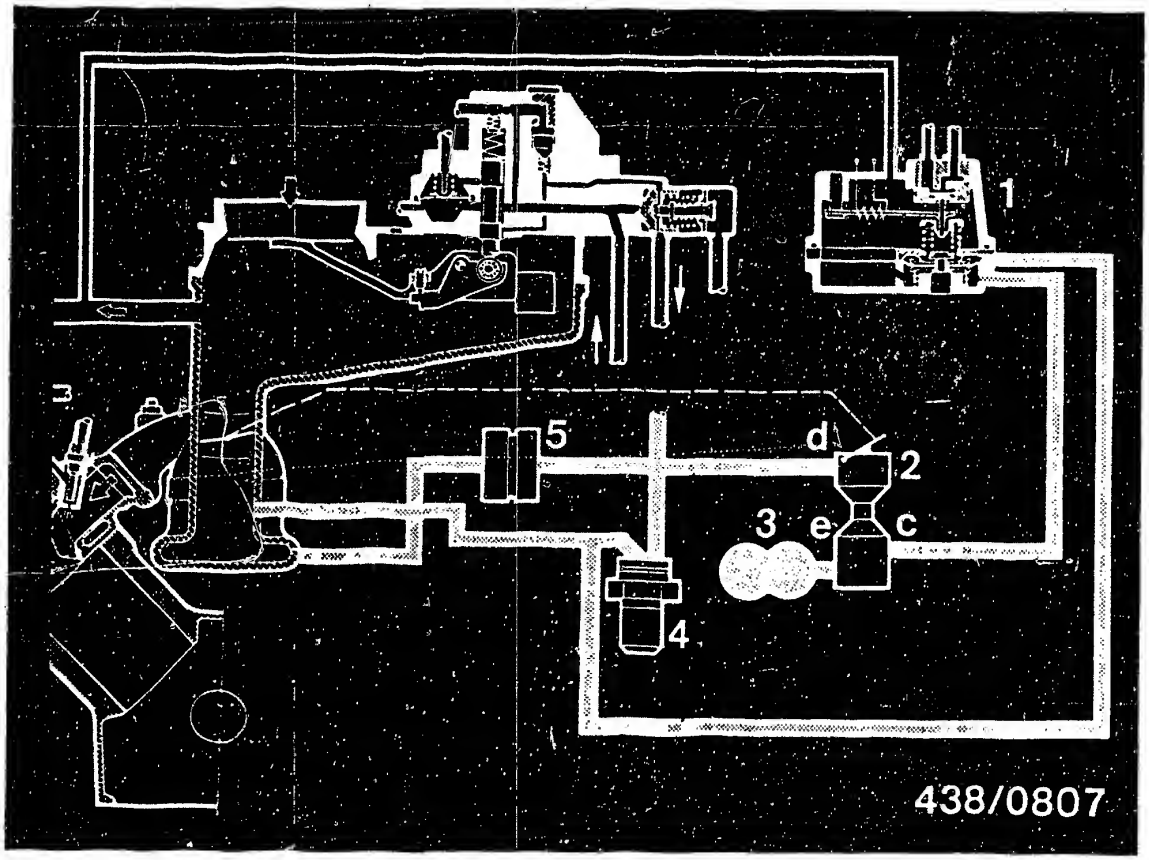
Vacuum is applied to the two chambers of the warm-up regulator (1) from the intake manifold through the change-over valve (2), thermo-valve (4) and restriction (5).

Engine temperature below 50°C:

Acceleration enrichment through opening of the throttle valve.

At engine temperatures below 50°C the thermo-valve is closed.
The intake-manifold pressure acts directly on the warm-up regulator intermediate chamber, without delay.
In the warm-up regulator lower section the intake-manifold pressure acts with a delay through the restriction and the open change-over valve (d-c).

When the throttle valve is opened, there is a rapid pressure rise in the intermediate chamber. The enrichment diaphragm in the warm-up regulator moves briefly downward (acceleration enrichment).
There is the same pressure rise in the lower chamber, delayed by the restriction. The enrichment diaphragm moves upward (end of acceleration enrichment).



Engine temperature above 50°C, thermo-valve open.
Same vacuum

Engine temperature above 50°C:

Full-load enrichment with open throttle valve.

At engine temperatures above 50°C the thermo-valve is open; acceleration enrichment is thus switched off.
The same intake-manifold pressure acts in both warm-up regulator chambers and in the vacuum reservoir 3.

With the throttle valve open the change-over valve switches the connections e-c to open.
The high vacuum from the vacuum reservoir acts in the lower chamber on the enrichment diaphragm and pulls it downward (= full-load enrichment).
At the same time, full-load vacuum is applied to the intermediate chamber and boosts the force on the enrichment diaphragm.

Tests:

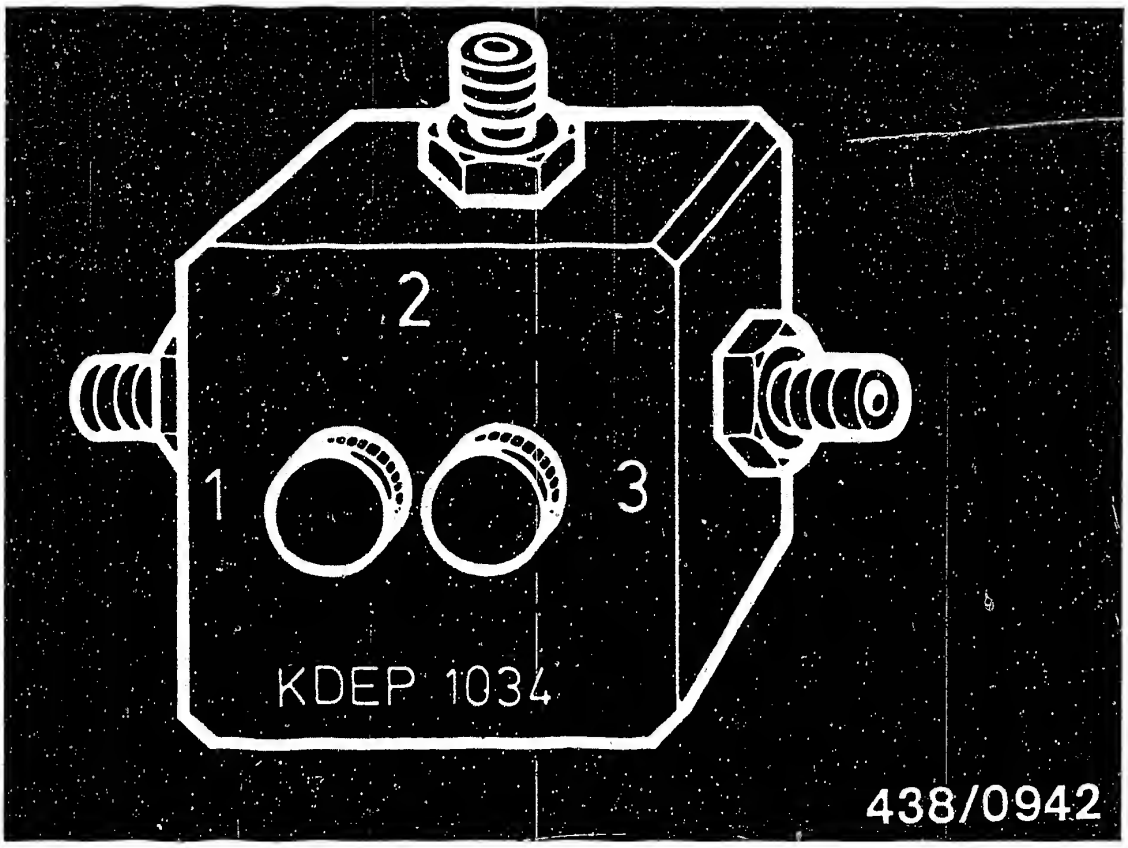
- Testing the routing of the lines and the connections according to the diagram of lines.

- Testing for leaks with the "Mityvac" hand vacuum pump.
  Testing the components with the engine running.

- Testing the thermo-valve.
  The thermo-valve is tested for throughflow.
  Below 50°C the valve is closed,
  above 50°C the valve is open.

- Testing the change-over valve.
  The change-over valve is tested for throughflow.
  With the throttle valve in the idle position, d...c is open.

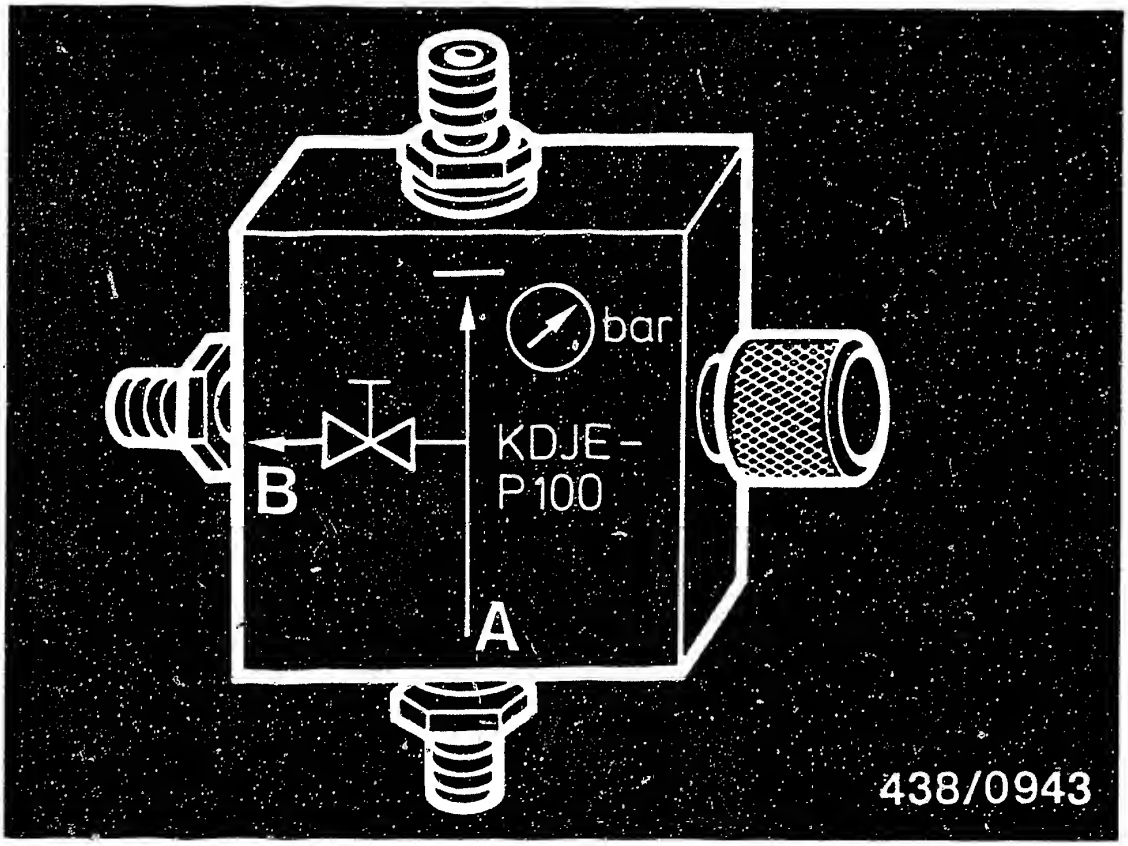
  With the throttle valve in the full-load position, e...c is open.



16. Testing and adjusting the primary (system) pressure:

16.1 Mounting the pressure tester KDJE-P100 (formerly KDEP 1034):

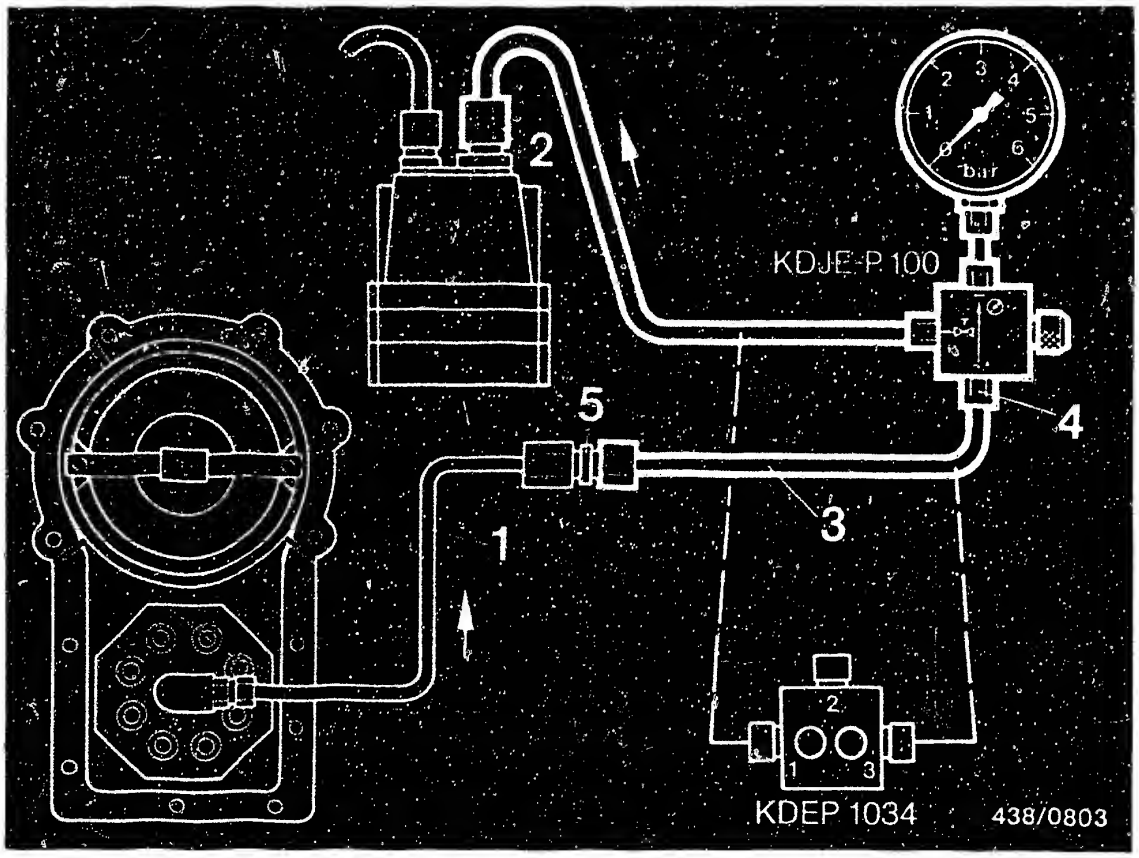
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered.



Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw. The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

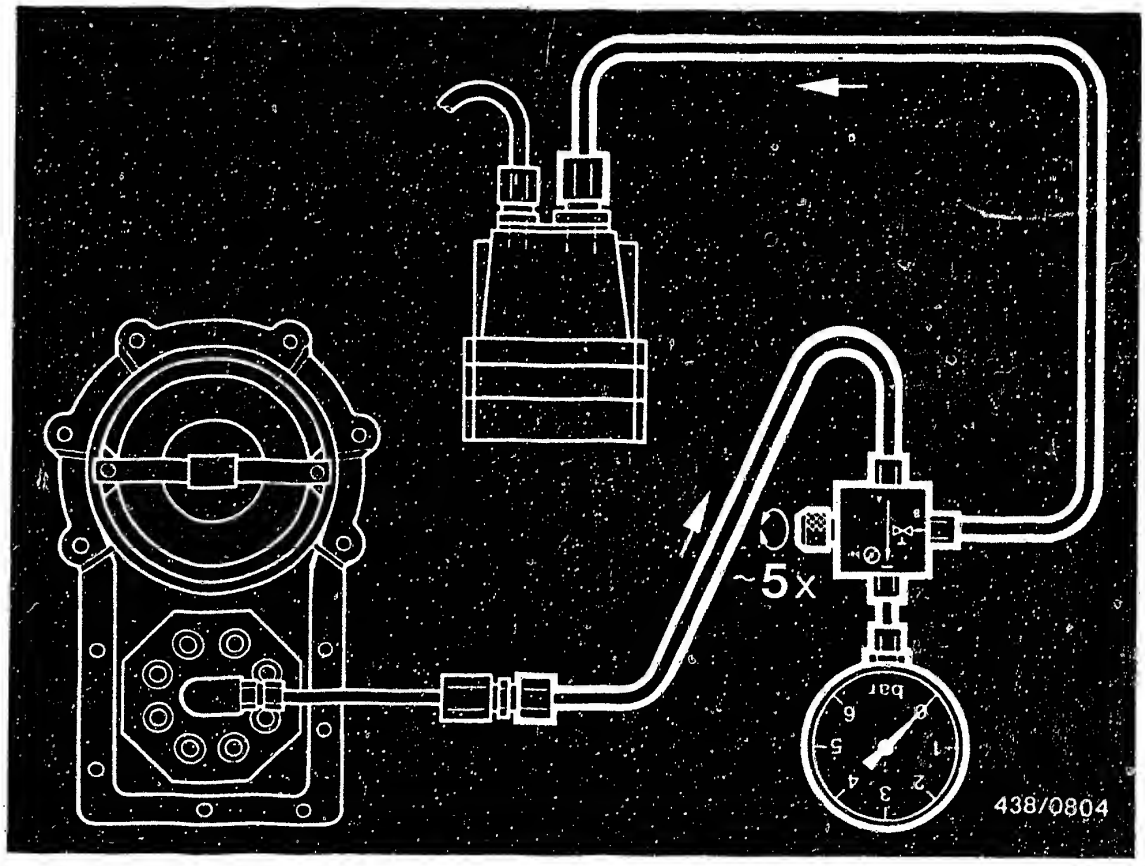
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.
Fit using connecting-parts set KDJE-P 100/11.

Unscrew the control-pressure line (1) on the warm-up regulator. Connect the end of the hose (2) of the directional-control valve to the warm-up regulator inlet.
Connect the connecting hose KDJE-P 100/11/1 (3) to the inlet fitting (4) of the directional-control valve.
Screw the double fitting (5) into the connecting hose and connect to control-pressure line (1).

Steel control-pressure line must not be kinked!
Suspend the pressure gauge from the engine-compartment lid.



16.2 Bleeding the pressure tester

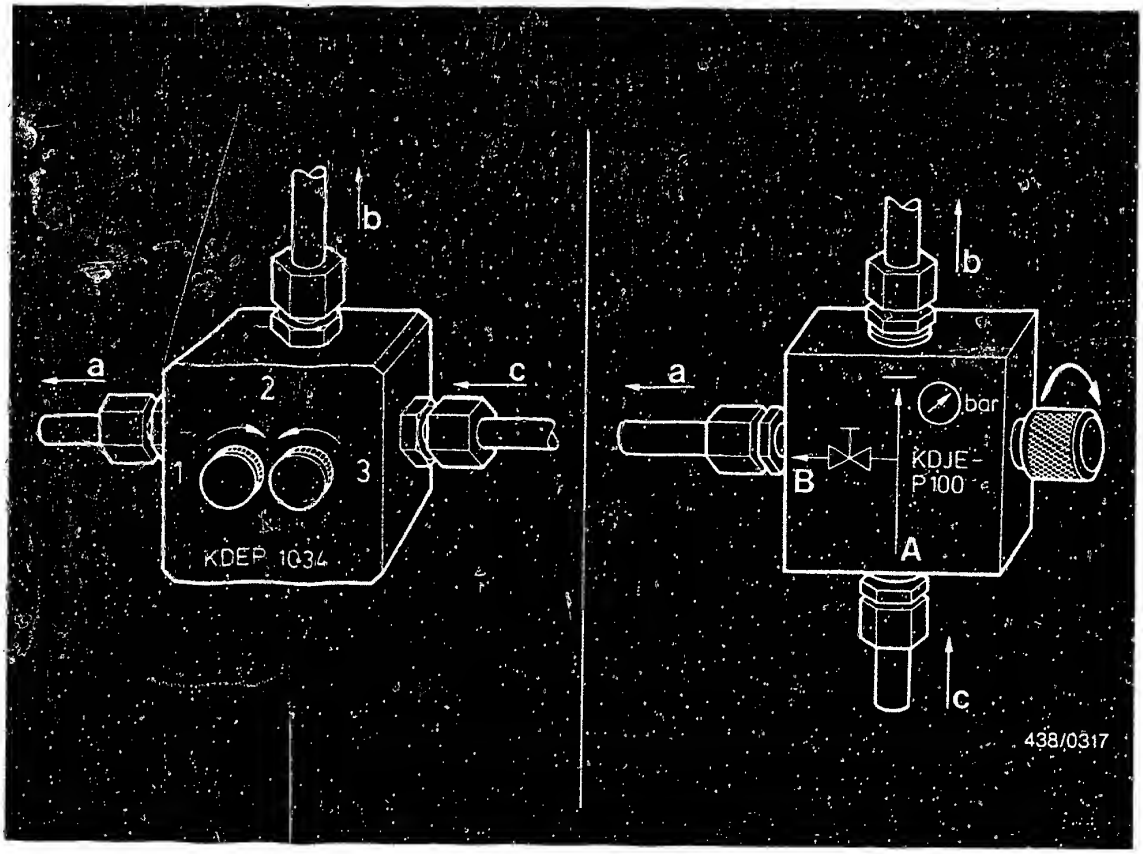
Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electrical fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

16.3 Testing the primary pressure:

The test is performed with the engine switched off.
The temperature of the engine is not important.
Close the valve screw of directional-control valve KDJE-P100.
In the case of KDEP 1034, close valve screw 1, open valve screw 3.

Switch on the electric fuel pump by bridging the electrical safety circuit.

The pressure gauge now indicates the primary pressure.

Fuel distributor Part No.	Test specifications - primary pressure (gauge pressure)
0 438 100 111/...112 0 438 100 068/...089	4.7...5.4 bar (4.8...5.5 kgf/cm^2)

Possible causes for too low a primary pressure:

- Fuel supply faulty.
  (Delivery of electric fuel pump too low).

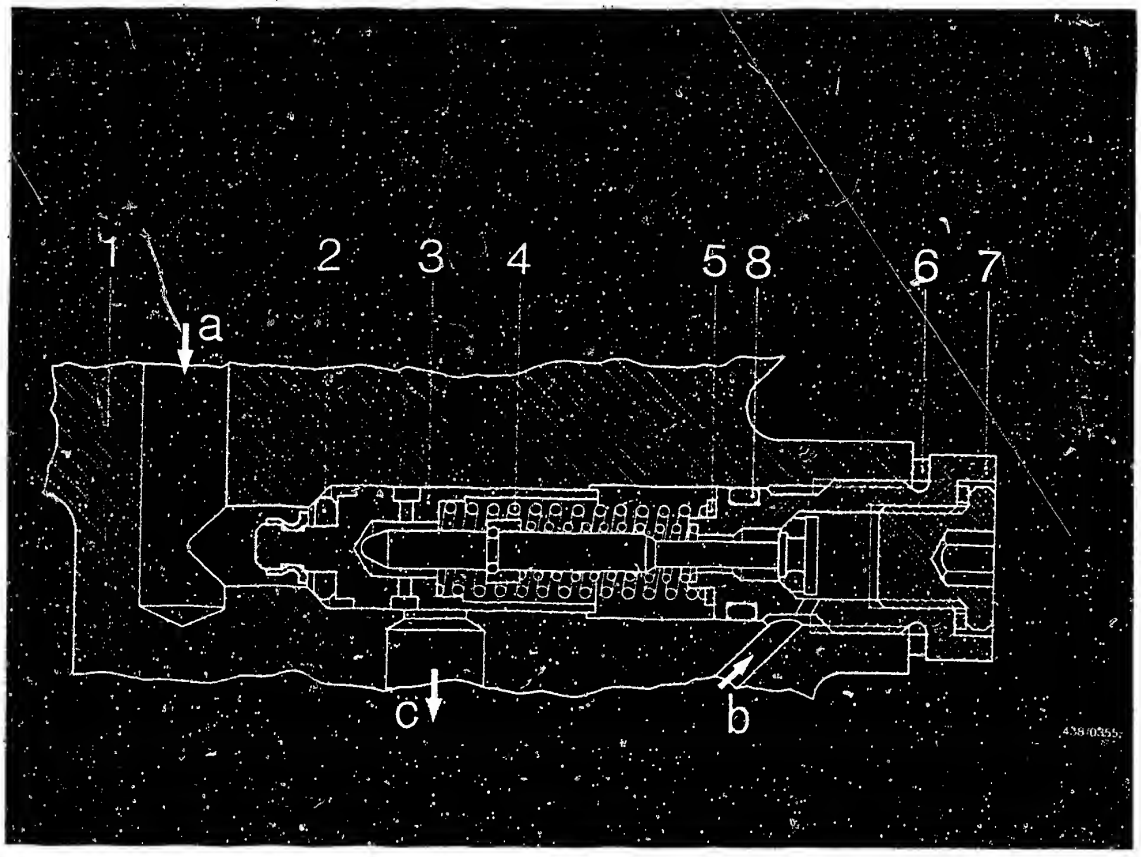
- Primary pressure set incorrectly.
  A precondition for readjustment of the primary pressure is always that the fuel supply is in order.
  Measure the fuel delivery.

  3.8 l engine: min. 1000 cm^3/30 s
  5.0 l engine: min. 1100 cm^3/30 s

Possible causes for too high a primary pressure:

- A restriction in the return line leading to the fuel tank.

- Primary-pressure regulator set incorrectly.
  A precondition for readjustment of the primary pressure is always that the fuel supply is in order.

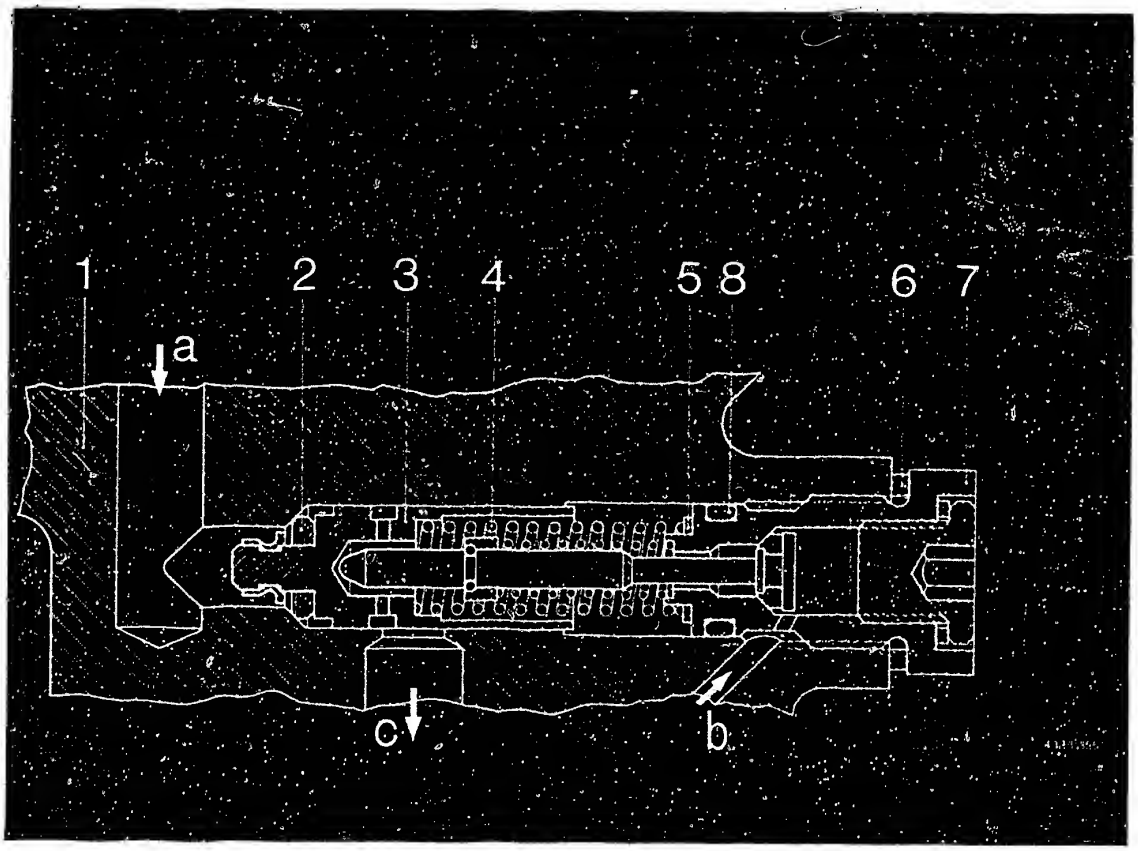


a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = Shaped ring (formerly O-ring)
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = Flat seal ring
7 = Screw plug
8 = O-ring

16.4 Adjusting the primary pressure:

Primary-pressure adjustment values:

Fuel distributor Part No.	Adjustment values - primary pressure
0 438 100 111/...112 0 438 100 068/...089	4.9...5.1 bar (5.0...5.2 kgf/cm² gauge pressure

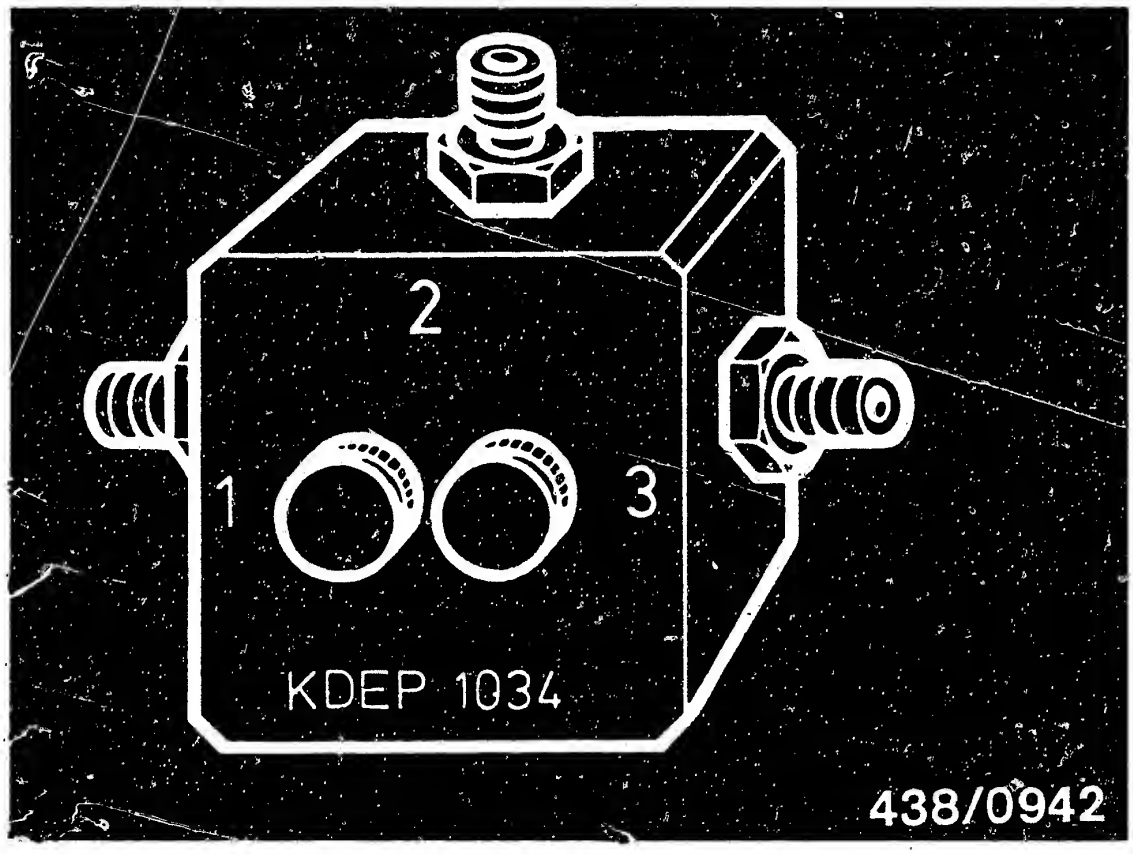


The primary pressure is readjusted by replacing the shims (Item 5).

Note:
0.1 mm more of shim thickness means about 0.15 bar pressure increase and vice versa.

To do this, screw out the large screw plug (Item 7) together with the push valve. After carrying out the adjustment, always fit the screw plug with a new flat seal ring (Item 6) and O-ring (Item 8).

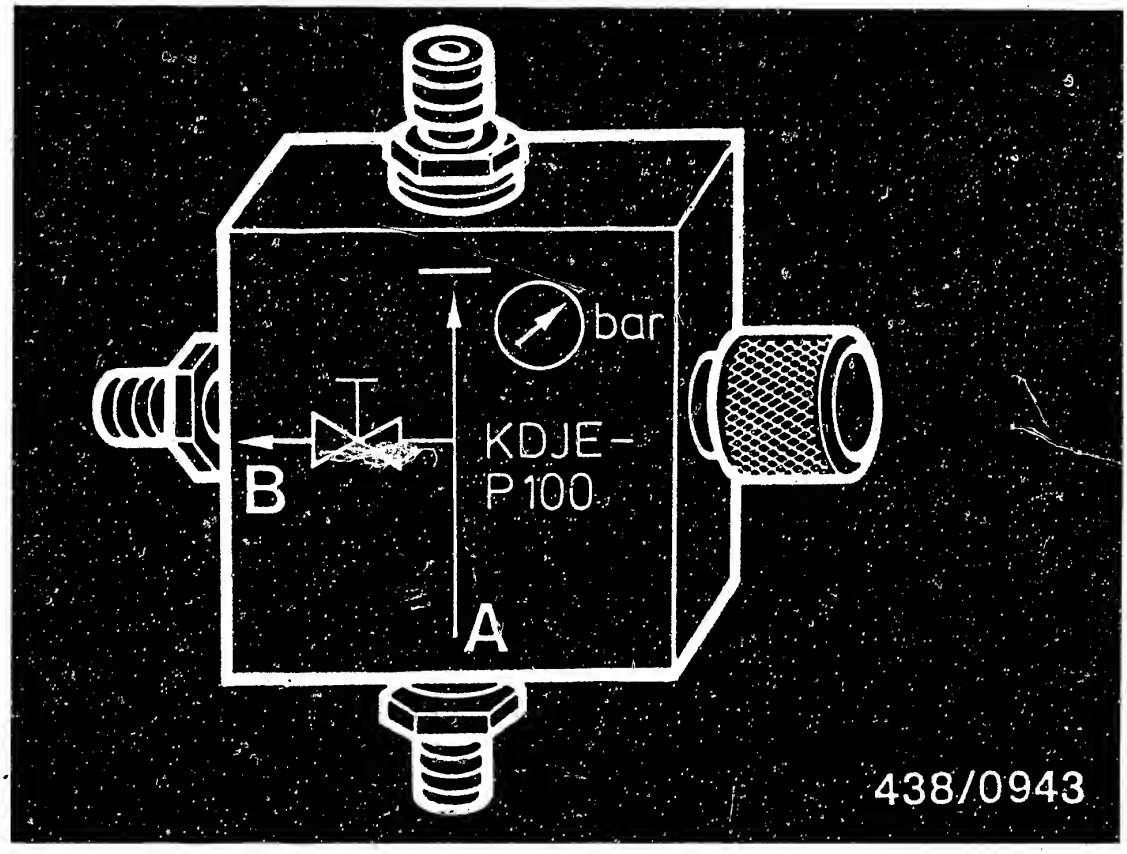
The control piston (Item 3) of the primary-pressure regulator must not be lost. It was matched specially to the fuel distributor housing in the manufacturing plant and therefore is the only part of the primary-pressure regulator which must not be replaced.



17. Testing the entire fuel system for leaks.

17.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered.

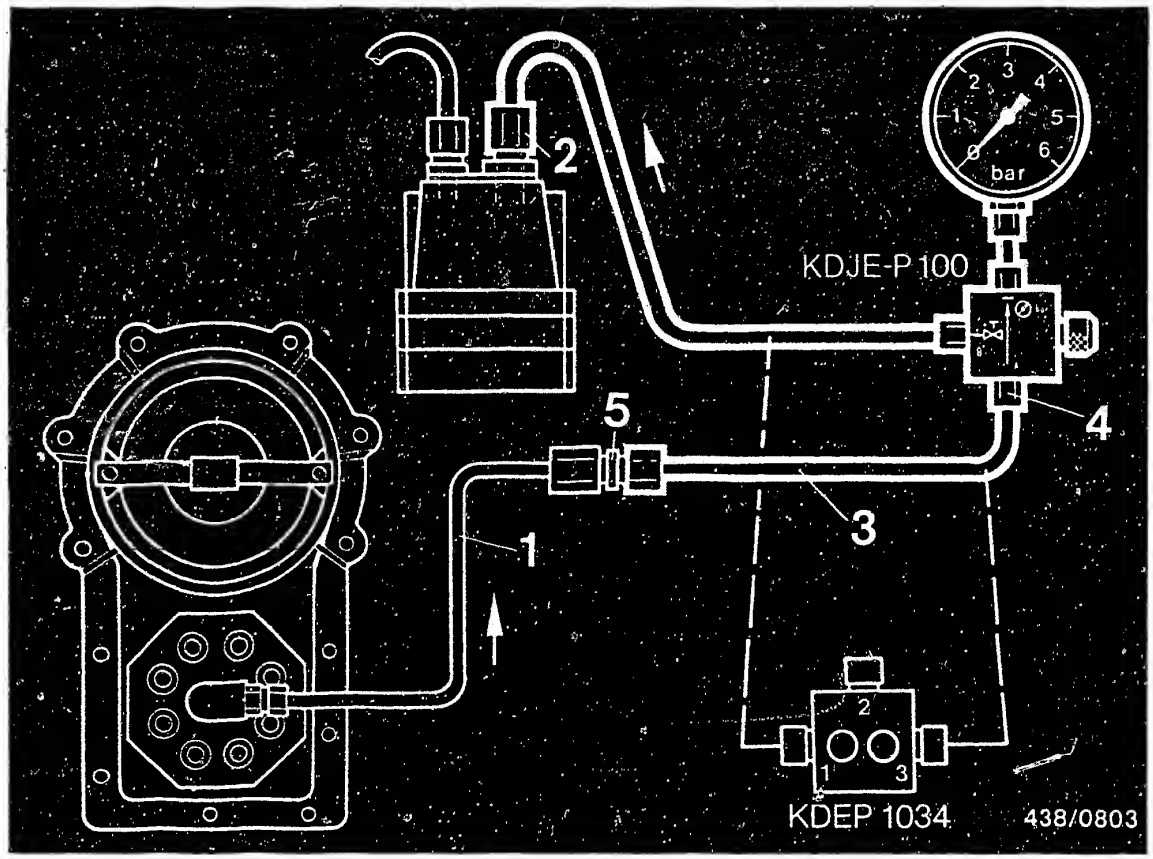


Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw. The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:

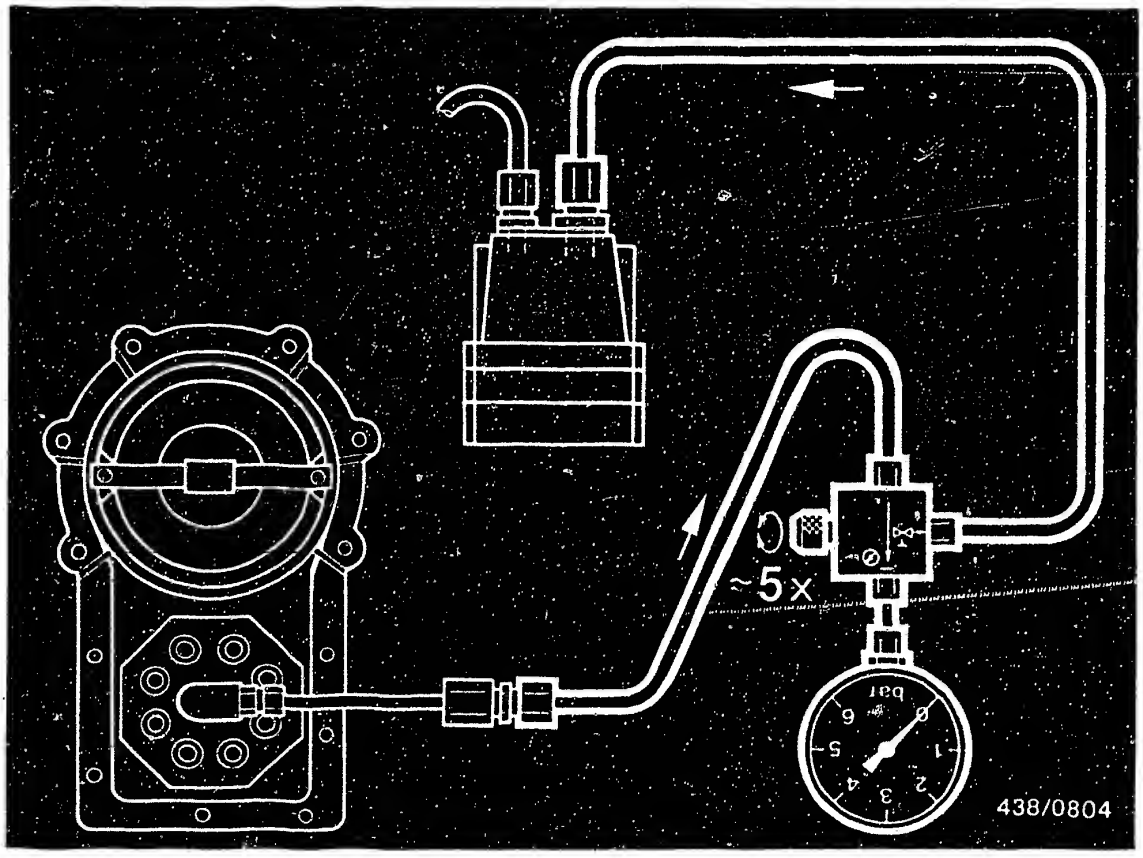
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.
Fit using connecting-parts set KDJE-P 100/11.

Unscrew the control-pressure line (1) on the warm-up regulator. Connect the end of the hose (2) of the directional-control valve to the warm-up regulator inlet.
Connect the connecting hose KDJE-P 100/11/1 (3) to the inlet fitting (4) of the directional-control valve.
Screw the double fitting (5) into the connecting hose and connect to control-pressure line (1).

Steel control-pressure line must not be kinked!
Suspend the pressure gauge from the engine-compartment lid.

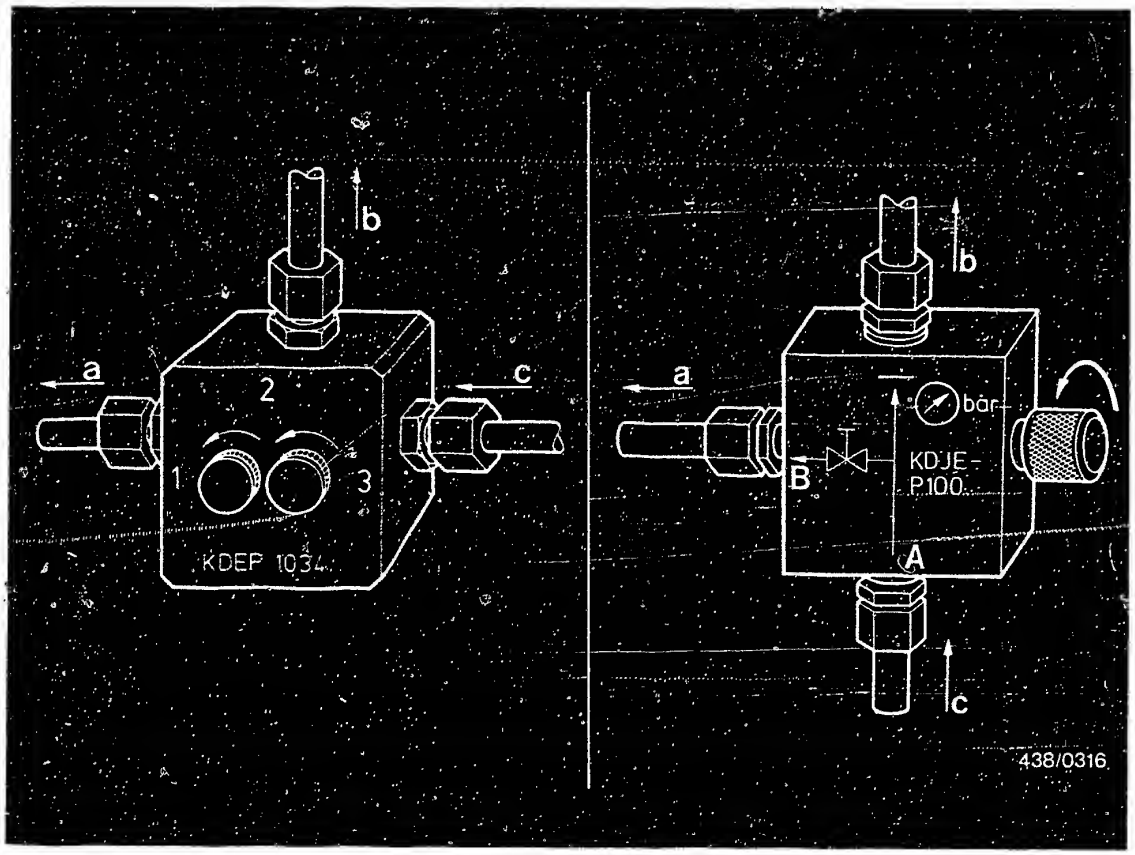


17.2 Bleeding the pressure tester

Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).. Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood). Open valve screw of directional-control valve (both screws in the case of KDEP 1034)(turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

17.3 Leak test

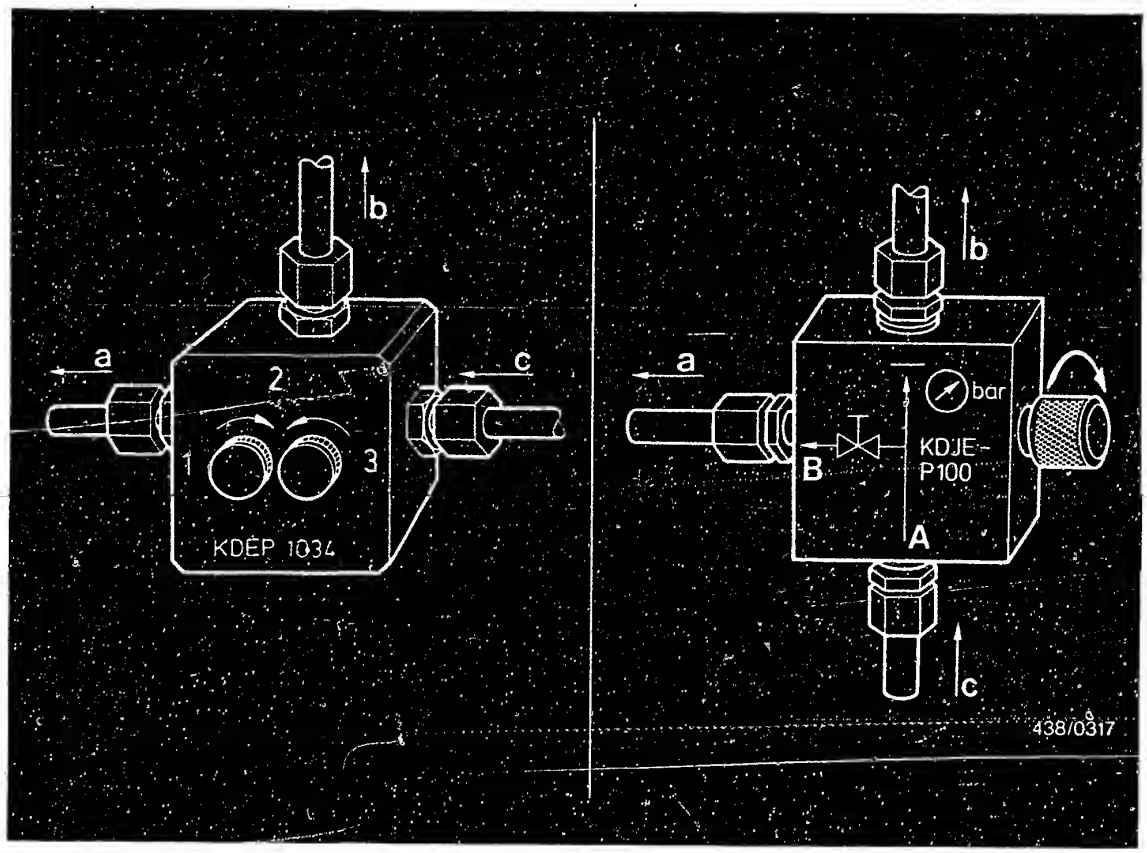
The test is performed with the engine switched off. Make the test with a warm engine but not immediately after the engine has been operated at a high temperature.
Open the valve screw of the directional-control valve (both valves in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit until the warm-up regulator has ceased to operate ("warm" control pressure).

Switch the electric fuel pump off again and observe the drop in pressure on the pressure gauge.

Test specifications for leak test:

Minimum pressure (gauge pressure)
after 10 minutes: 2,7 bar (2,8 kgf/cm^2)
after 20 minutes: 2,6 bar (2,7 kgf/cm^2)

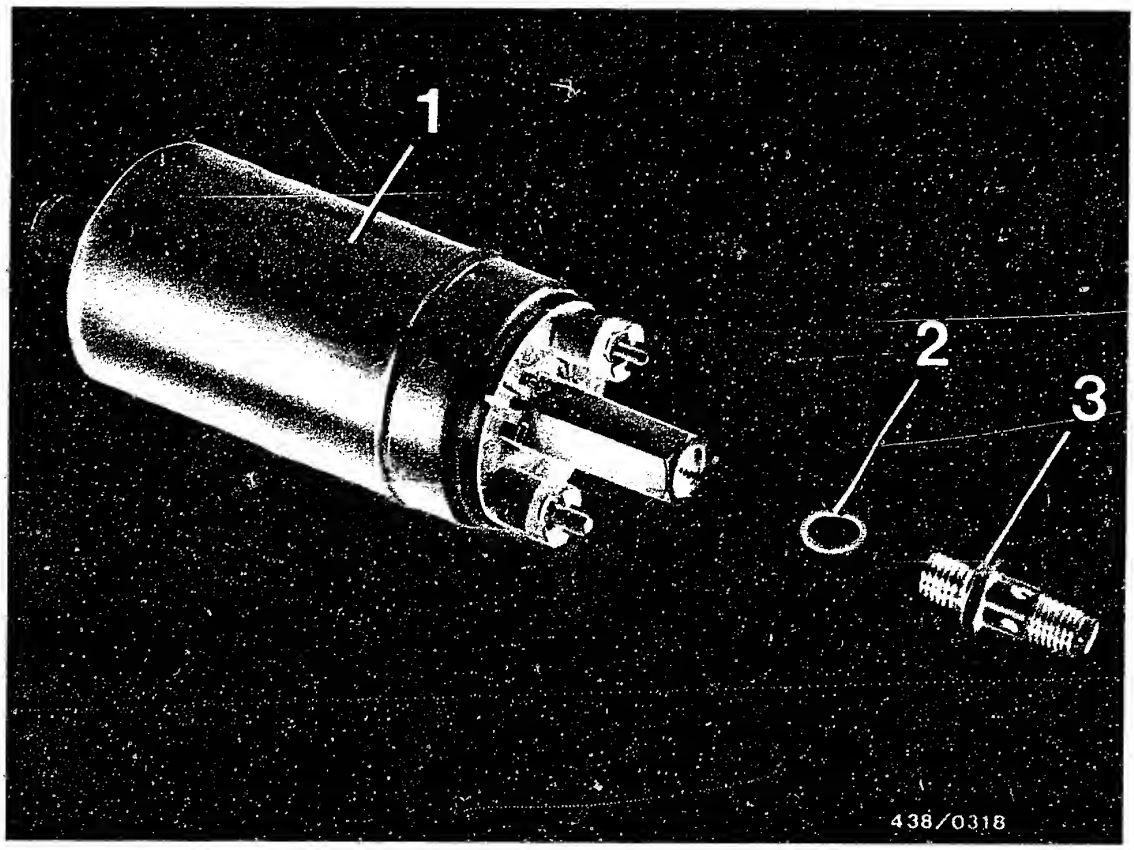


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

If the pressure drops too quickly, repeat the test with the control-pressure circuit disconnected.

Position of the valve screws:
Close the valve screw of the directional-control valve KDJE-P 100.
In the case of KDEP 1034, close valve screw 1, open valve screw 2.

If the same result is found, the leak is in the primary-pressure circuit.
If the test results are correct during the second test, the leak is in the control-pressure circuit.



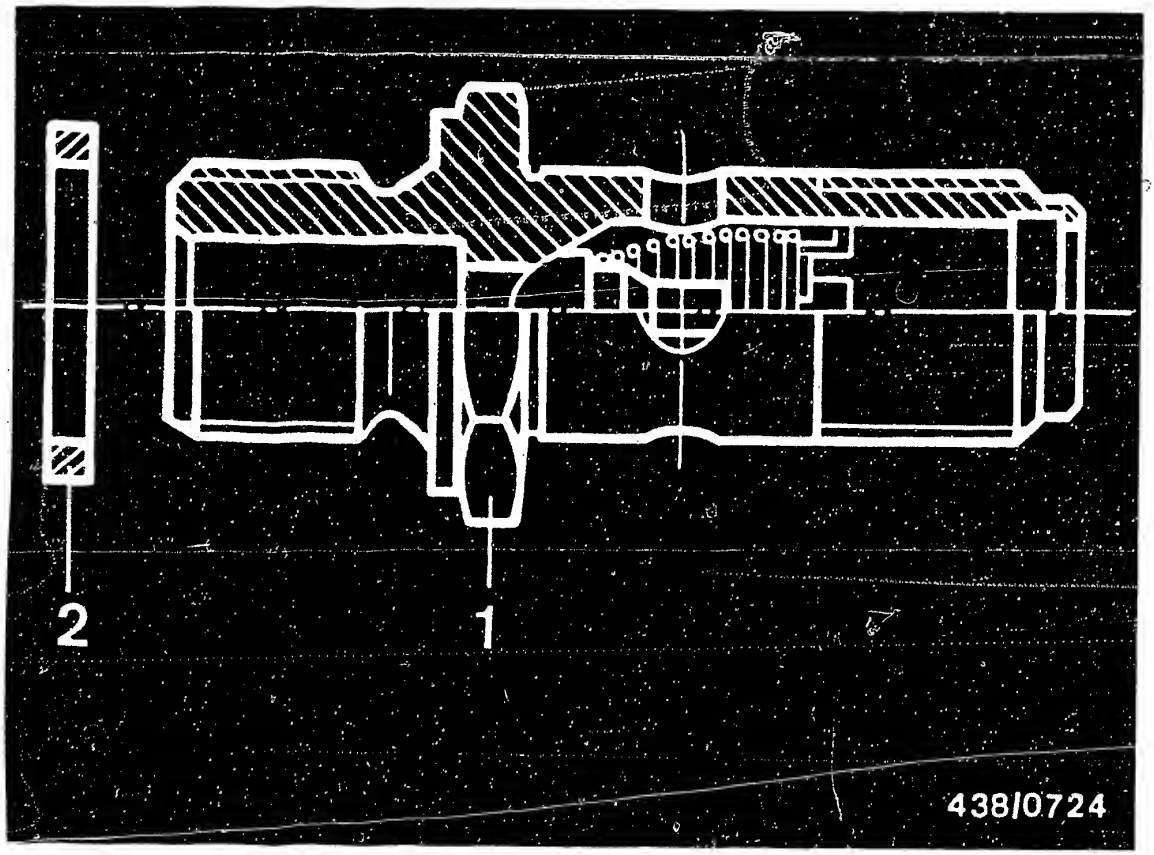
1 = Electric fuel pump
2 = Flat seal ring
3 = Tube fitting

17.4 Possible causes of a defect in the primary-pressure circuit:

- Non-return valve in the pressure connection piece of the electric fuel pump has a leak.

Part No. of electric fuel pump: 0 580 254 973
0 580 254 974

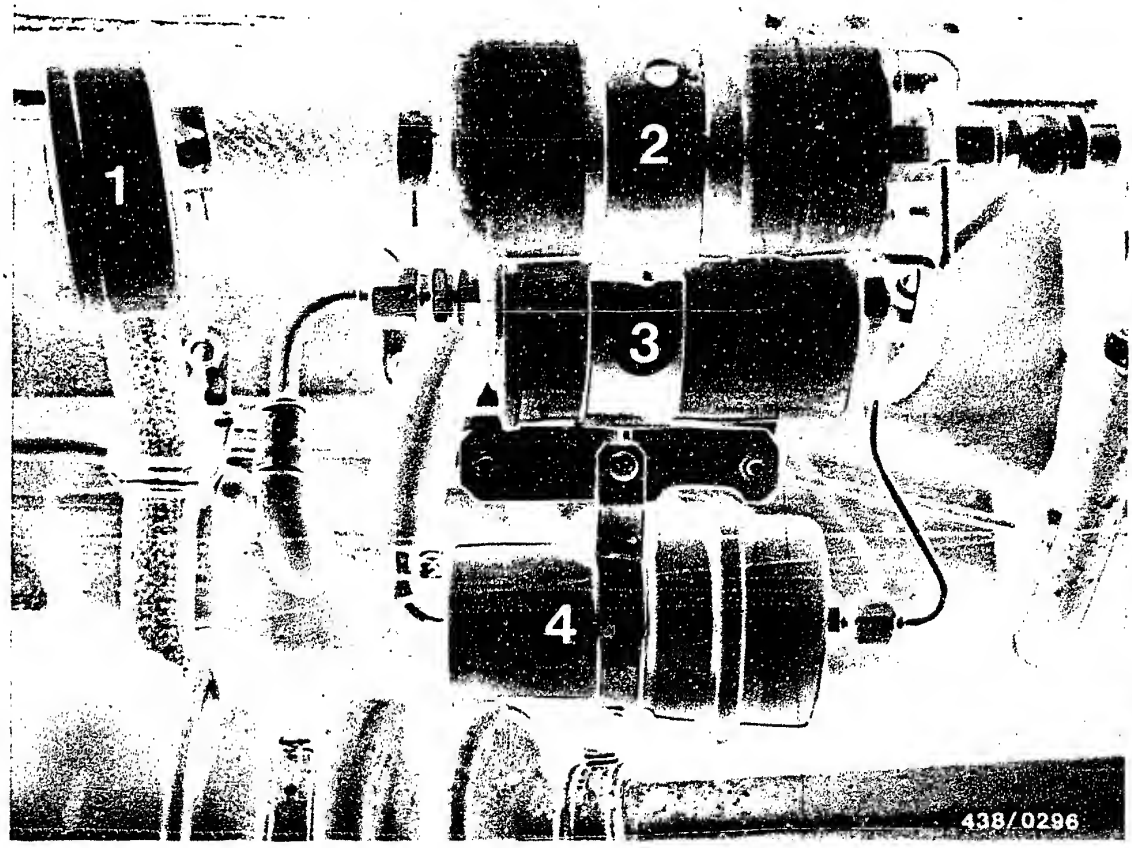
The non-return valve is built into the tube fitting.



1 = Tube fitting with built-in non-return valve
2 = Flat seal ring

Parts set: 1 587 010 002

If necessary, replace the tube fitting from the parts set 1 587 010 002 as follows:



1 = Intake-noise damper
2 = Electric fuel pump
3 = Fuel filter
4 = Fuel accumulator

Installing the parts set:

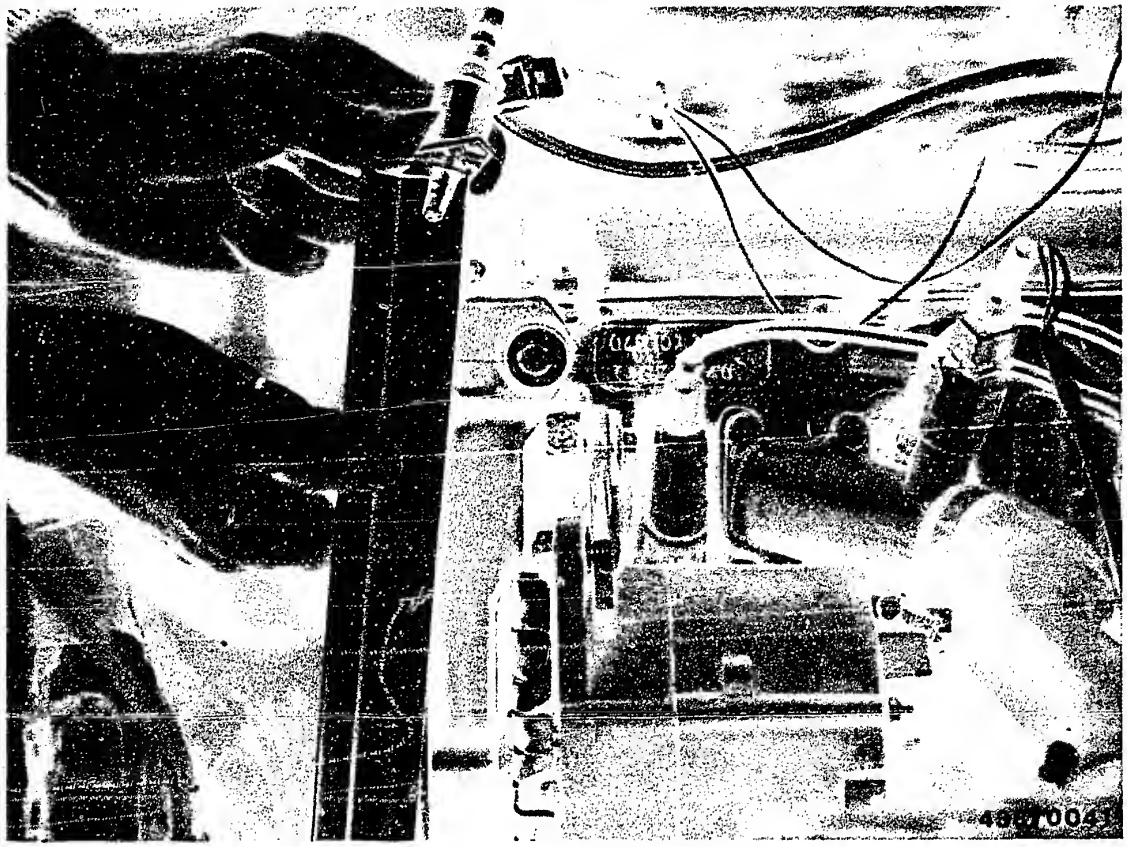
Remove the dirt-deflector plate and thoroughly clean the connection of the delivery line on the electric fuel pump.
Pinch off the intake hose (between fuel tank and intake-noise damper), for example, using hose clamper W 157 from the Matra Co.

Screw off the delivery line, collecting any escaping fuel.

Screw out the defective tube fitting.

Screw a new tube fitting (short end) with thick flat seal ring into the pressure connection piece and tighten to a torque of 17...25 Nm while at the same time applying a wrench to the hexagonal section of the pressure connection piece. Fit a thin flat seal ring, fuel-line union and another flat seal ring onto the long end of the tube fitting and tighten with the hexagon cap nut.
Remove hose clamper from intake hose.

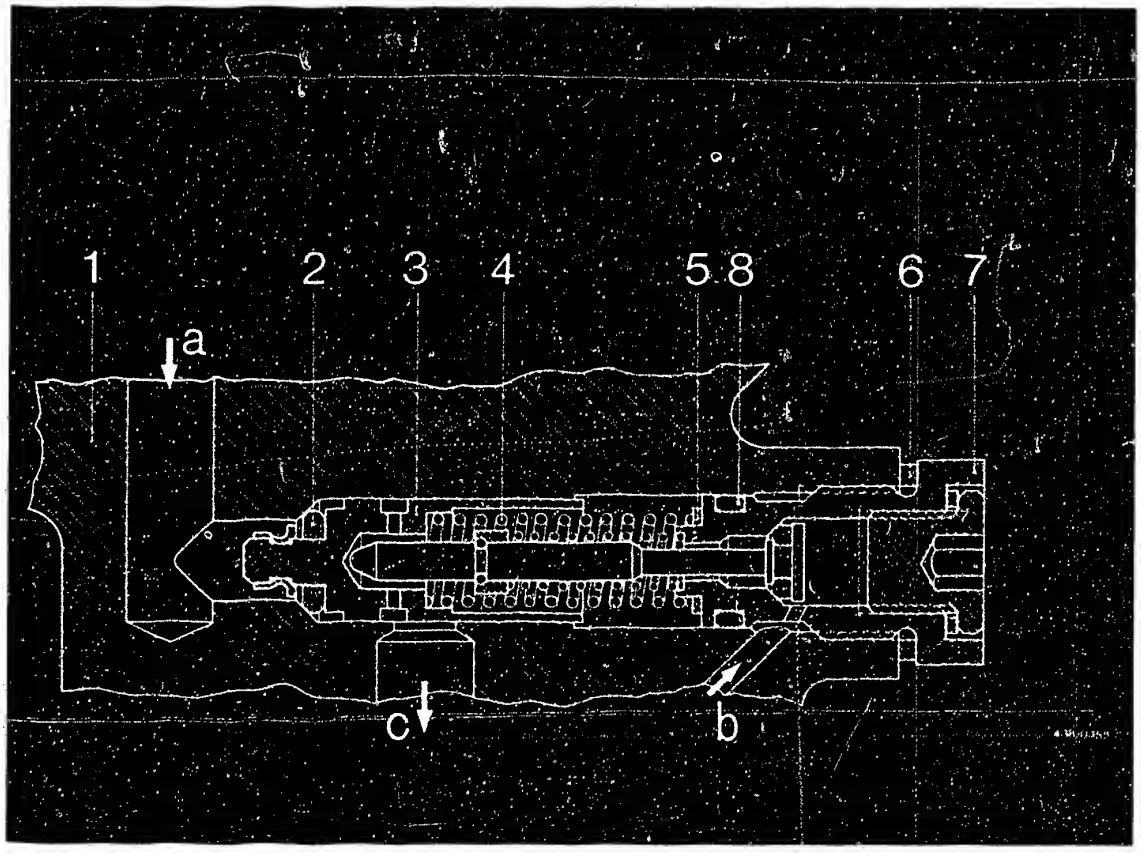
Check connections for leaks with the electric fuel pump in operation.



- Starting valve leaks

Take out the starting valve, connect a hose (e.g., KDJE-P 100/11/1) instead of the steel pipe.

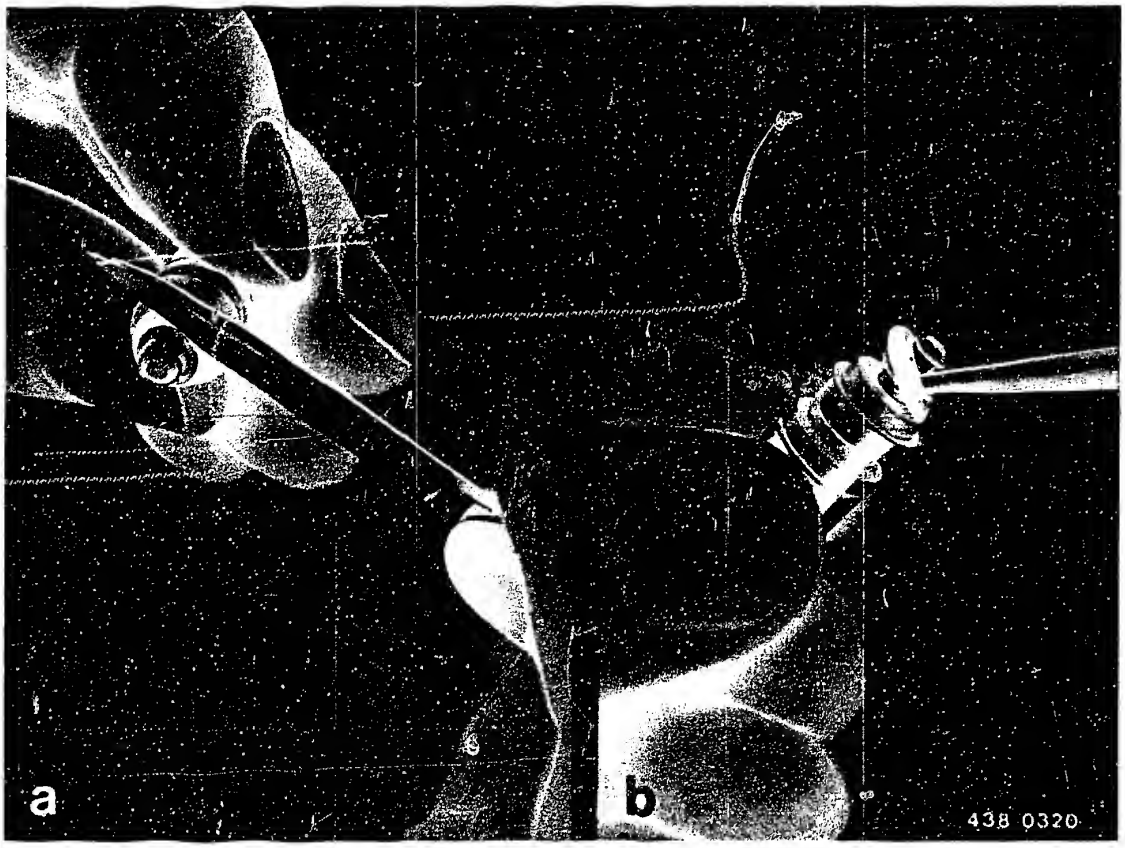
Hold start valve in a suitable container (e.g. graduate).
Switch on the electric fuel pump by bridging the electrical safety circuit.
Dry off the nozzle of the cold-start valve.
No drops must fall from the nozzle of the start valve within the next minute. Even when shaken and knocked, the start valve must not leak.
Switch the electric fuel pump off again.
Replace the cold-start valve if leaky.
Finally, adjust idle speed with the engine at operating temperature. See Coordinates F 18.



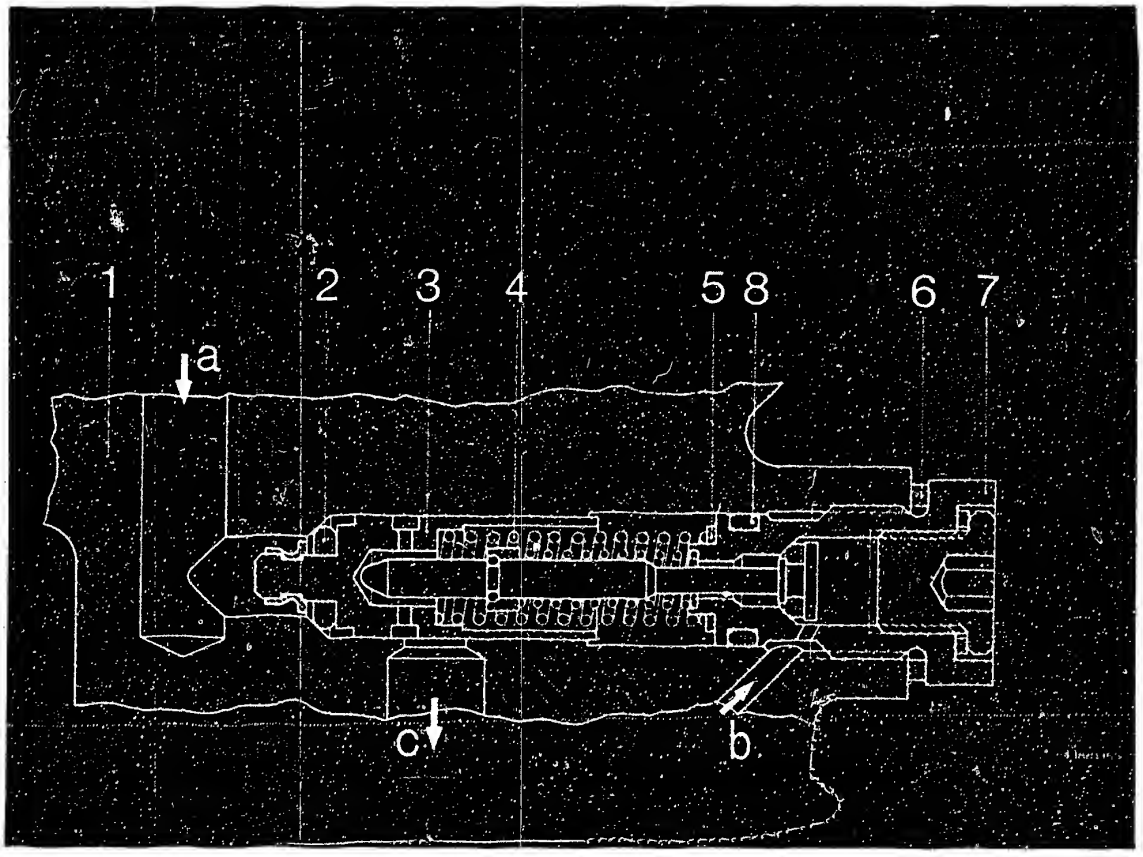
a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = Shaped seal ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = Flat seal ring
7 = Screw plug
8 = O-ring

- Shaped seal ring on control piston of primary-pressure regulator leaking.

Replacing the shaped seal ring:
Clean the fuel distributor in the area of the primary-pressure regulator. Unscrew large screw plug (7) with complete push-up valve. Also remove shims (5), control spring (4) and control piston (3).



The seal ring is replaced without removing the retaining ring:
Cut open the old seal ring and remove (Fig. a).
Slip the new seal ring over the retaining ring using a blunt marking tool (Fig. b). Do not overstretch the seal ring when doing this.
Then carefully check whether the seal ring has been fitted without being damaged. It must be possible to turn the retaining ring by hand. Between retaining ring and seal ring there must be a clearance of approx. 0.2 mm.



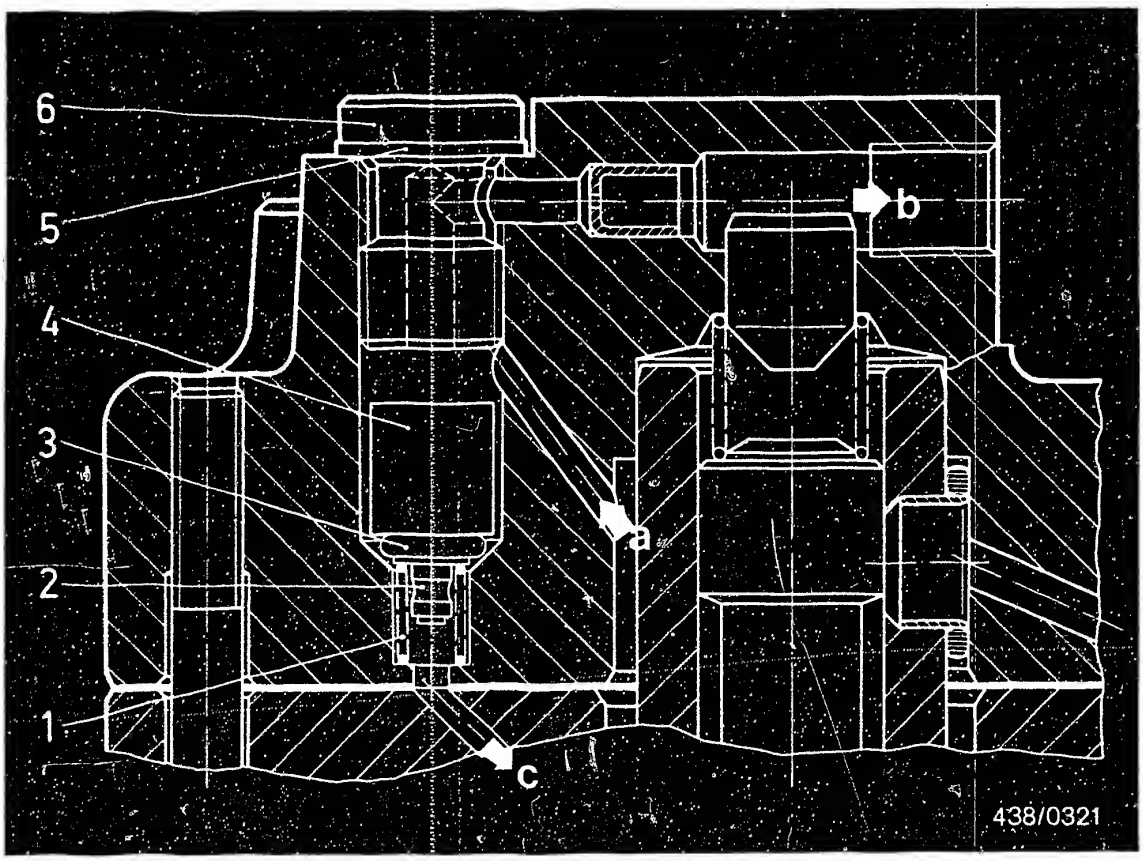
Finally, check the primary pressure and, if necessary, adjust by changing the shims (5).

Primary pressure

Fuel distributor

0 438 100 111 0 438 100 112	Checking value:	4.7...5.4 bar (4.8...5.5 kgf/cm²)*
0 438 100 068 0 438 100 089	Setting value:	4.9...5.1 bar (5.0...5.2 kgf/cm²)*

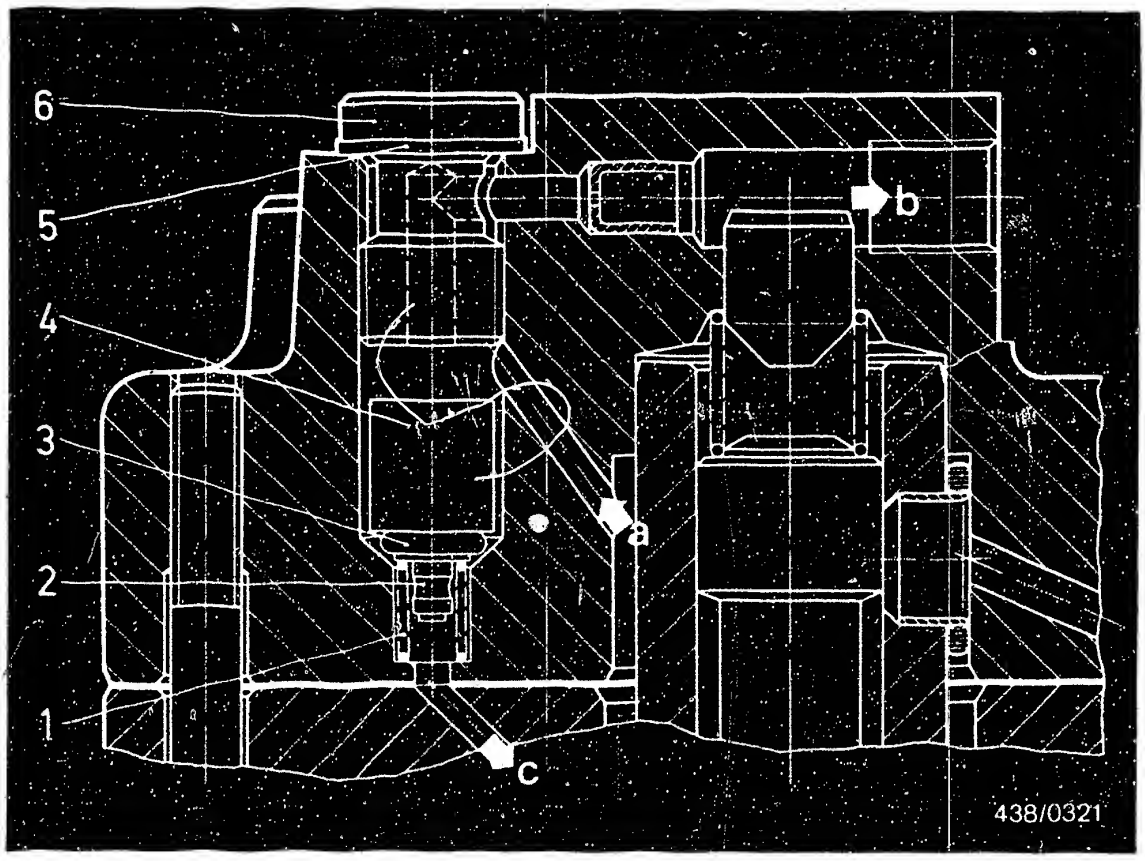
* Gauge pressure



a = Primary pressure
b = Control pressure (to warm-up regulator)
c = Fuel return
1 = Valve spring
2 = Retaining ring
3 = Shaped seal ring
4 = Valve piston
5 = Flat seal ring
6 = Screw plug

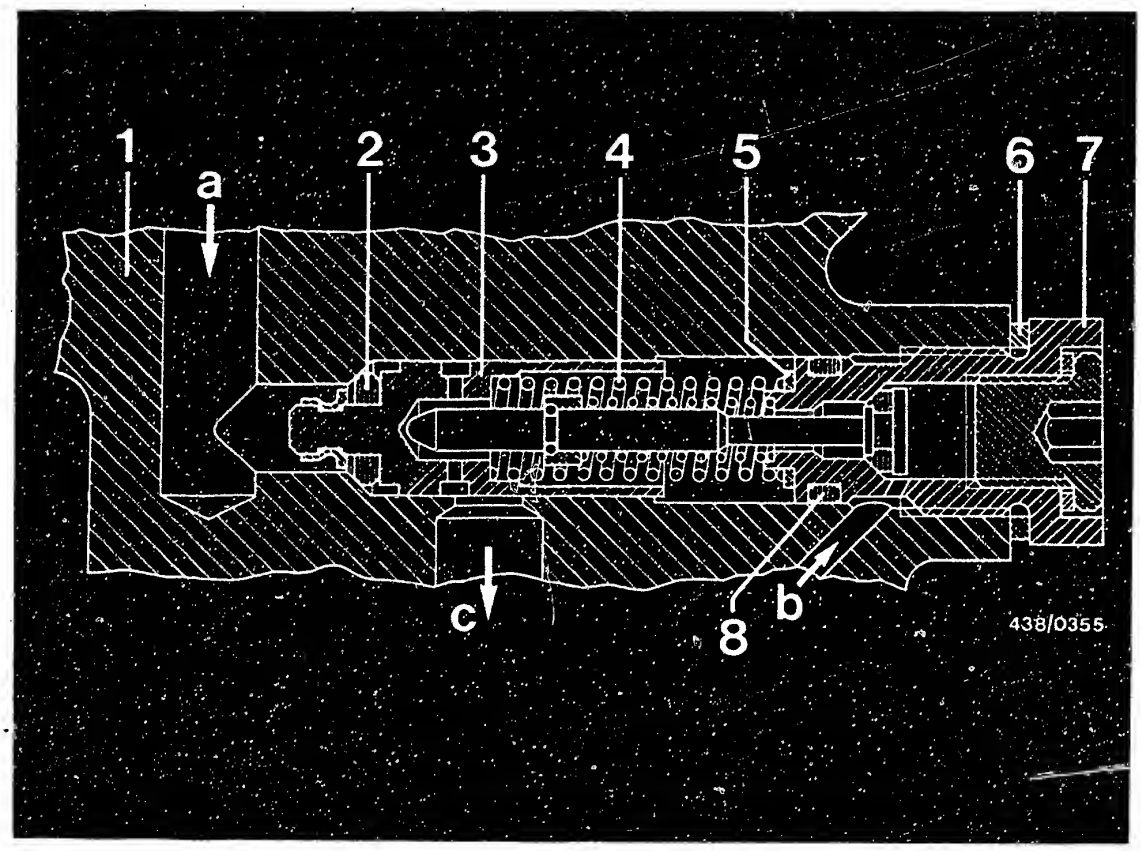
• Pressure-relief valve on control-pressure dome of fuel distributor has a leak.

Replace the complete pressure-relief valve.
The parts set contains all items 1 to 6.



a = Primary pressure
b = Control pressure (to warm-up regulator)
c = Fuel return
1 = Valve spring
2 = Retaining ring
3 = Shaped seal ring
4 = Valve piston
5 = Flat seal ring
6 = Screw plug

Clean the fuel distributor in the area of the control-pressure dome. Unscrew screw plug with 13 mm box wrench or, in the case of the previous version, using Torx off-set wrench size TX 730 (commercially available).
Remove the valve piston and valve spring.
Assembling the parts set:
Insert valve spring and partially assembled valve piston of parts set and seal bore with flat seal ring and screw plug.

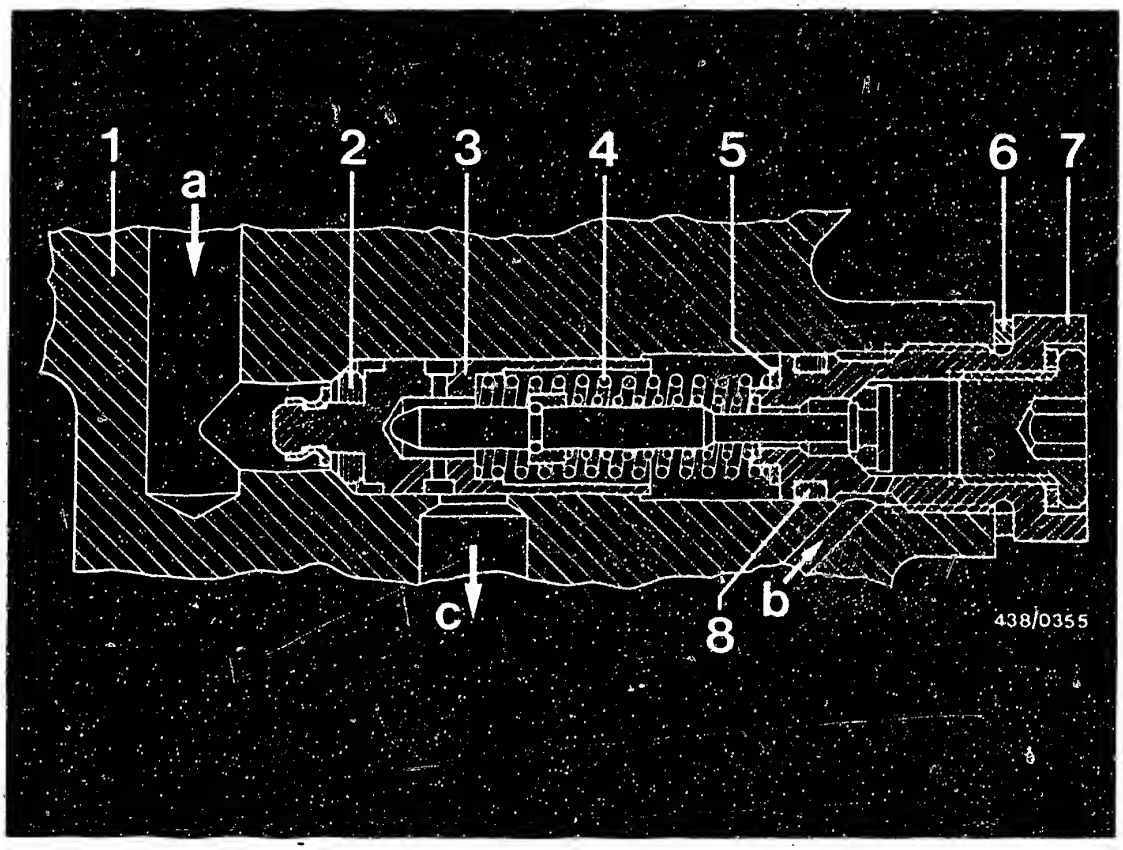


a = Primary pressure
b = From warm-up regulator
c = Fuel return

1 = Fuel-distributor housing
2 = Shaped seal ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = Flat seal ring
7 = Screw plug
8 = O-ring

17.5 Possible cause of trouble in the control-pressure circuit

Push-up valve in primary-pressure regulator leaking. The seal ring in the push-up valve is rigidly vulcanized onto the valve needle.



If there is a leak, therefore, it is necessary to replace the complete push-up valve (ready-assembled unit).

Clean the fuel distributor in the area of the primary-pressure regulator. Unscrew the large screw plug (7) with the complete push-up valve. Pay attention to the control spring (4) and shims (5).
Screw in the new push-up valve with the previously found number of shims (5), a new O-ring (8) and flat seal ring (6).
Then check the primary pressure once again and, if necessary, adjust by changing the shims (5).

Primary pressure, checking and setting values (gauge pressure)

Fuel distributor No.

0 438 100 111 0 438 100 112	Checking value:	4.7...5.4 bar (4.8...5.5 kgf/cm²)
0 438 100 068 0 438 100 089	Setting value:	4.9...5.1 bar (5.0...5.2 kgf/cm²)

18. Testing the injection valves

Remove the injection valves for testing.
When loosening the fuel lines, apply counter-force at the fixed hexagon of the injection valves.
Caution! Do not bend steel fuel lines!
When refitting the injection valves, it is best to replace the seal rings on the valve stem (Mercedes-Benz service part) in order to prevent leaks and thus the entry of unmetered air.

18.1 Test equipment and test media

The following testing specification refers to valve testers KDJE-P 400 (previously KDEP 7452) and 0 681 200 700.

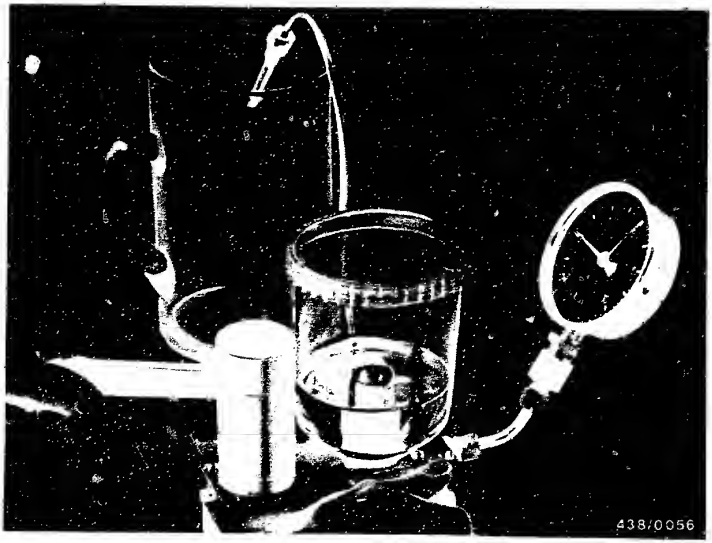
Observe the test-media specification!

Test media: Calibrating fluid (Shell K30, Esso-Varsol, Shell Mineral Spirits 135)
or
Bosch, Part No. VS 14 942-CH
(previously 5 973 650)

The calibrating fluid can be obtained in 5 l metal cans from the following supplier:

Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids. Even with calibrating fluid, be sure to observe the local official regulations.

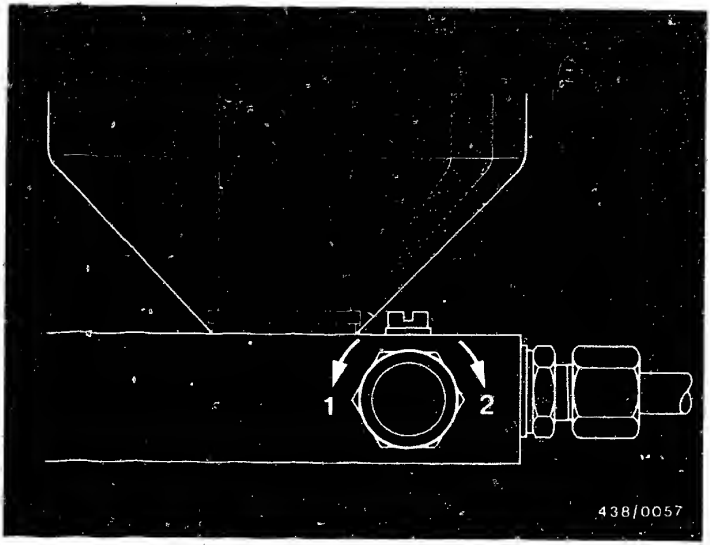


18.2 Connecting the injection valve to the tester

Connect the injection valve to the valve tester and bleed the delivery line by operating the lever several times with the union nut open. Then tighten the union nut.

18.3 Checking for dirt

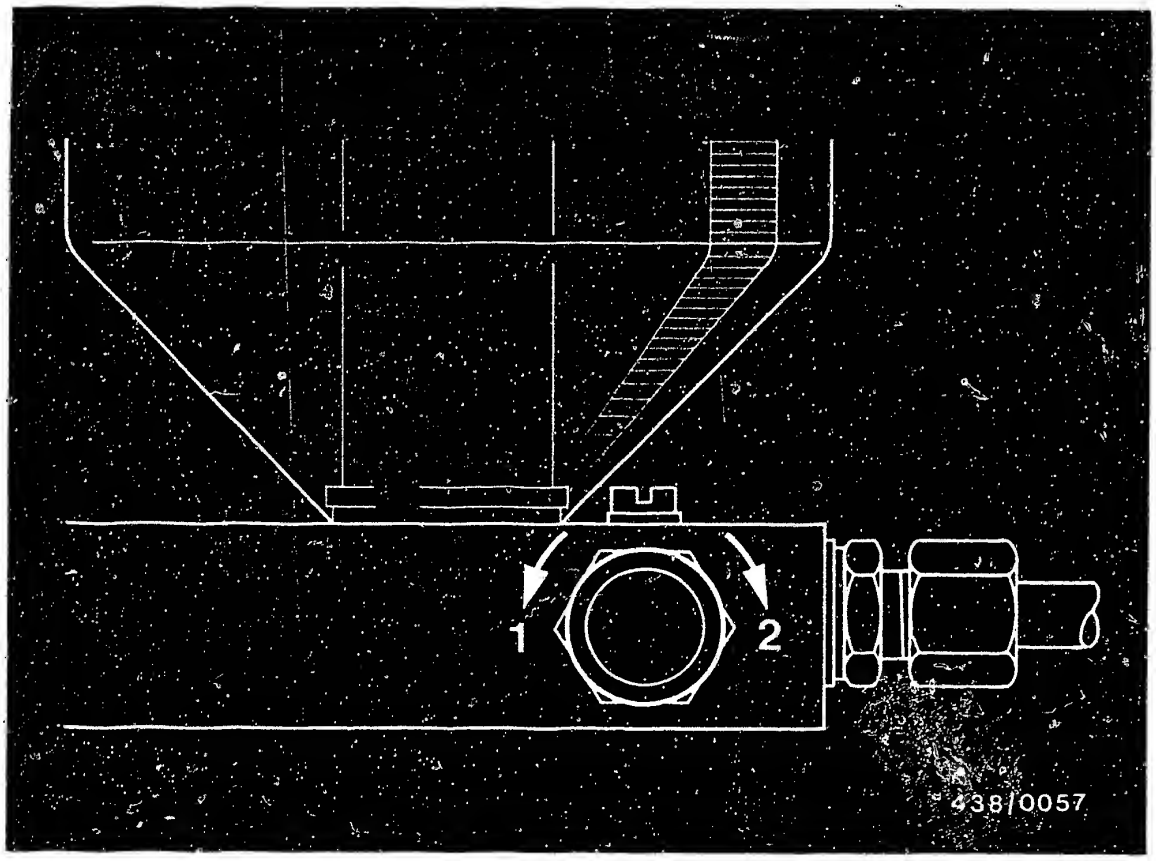
Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it).
You can try to flush the injection valve clear by moving the lever back and forth several times strongly.
If this attempt is successful, continue the test. If it is not possible to flush the valve clear, replace it.



1 = Open 2 = Close

18.4 Testing the opening pressure

Injection valve Part No.	Test specifications - opening pressure (gauge pressure)
0 437 502 010	3,0...4,1 bar (3,1...4,2 kgf/cm²)

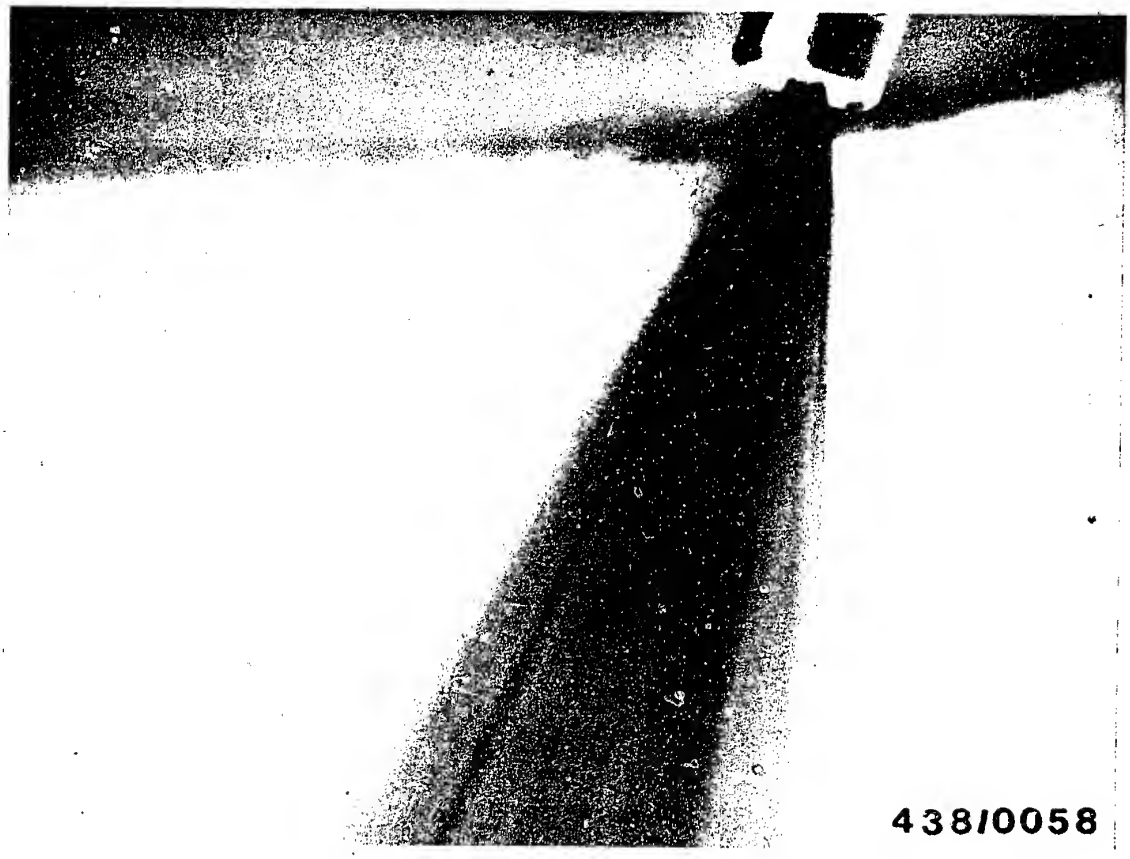


With the stopcock closed, flush the valve out and bleed it with several rapid movements of the lever.
Open the stopcock and test the opening pressure by moving the lever slowly (about 2 seconds per stroke).

If the opening pressure is outside tolerance, replace the injection valve. Individual valves can also be interchanged within a set.

18.5 Leakage test

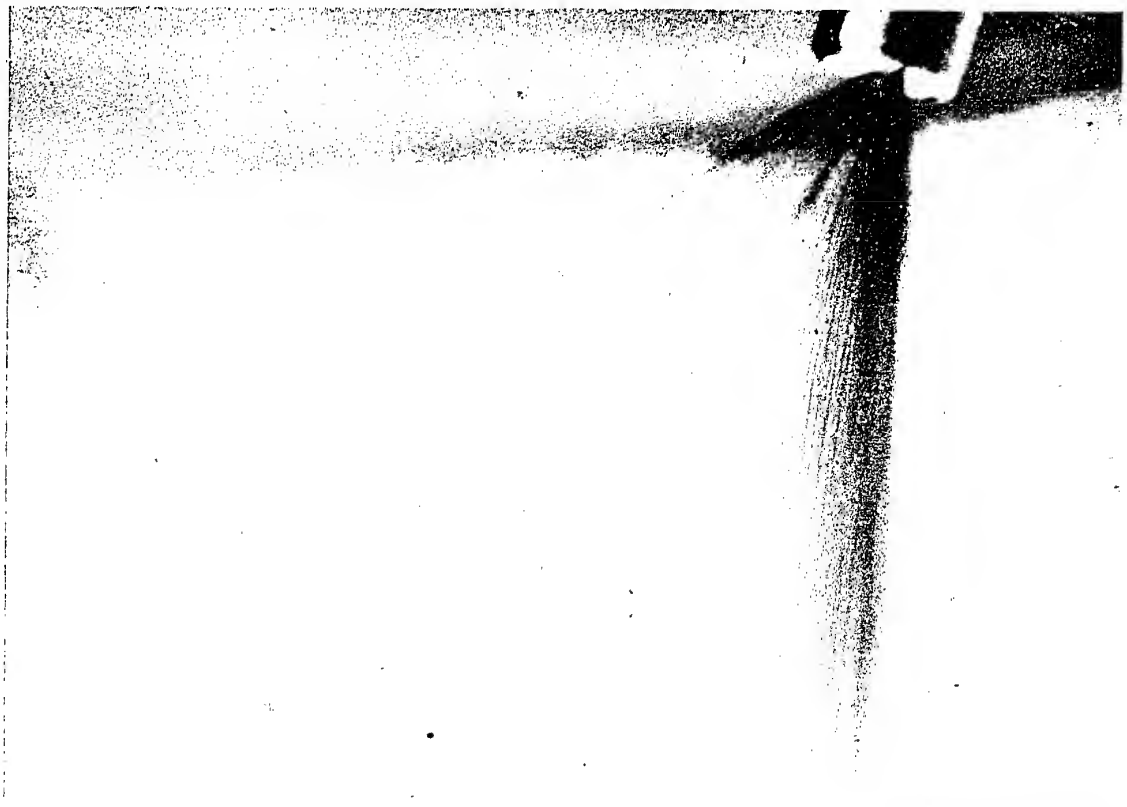
Open the stopcock, build the pressure up slowly to a value 0.5 bar under the opening pressure determined previously (but not less than 2.3 bar gauge pressure), and hold it constant at that level. No drops must now fall from the valve for the next 15 seconds.



18.6 Chatter test, evaluation of spray

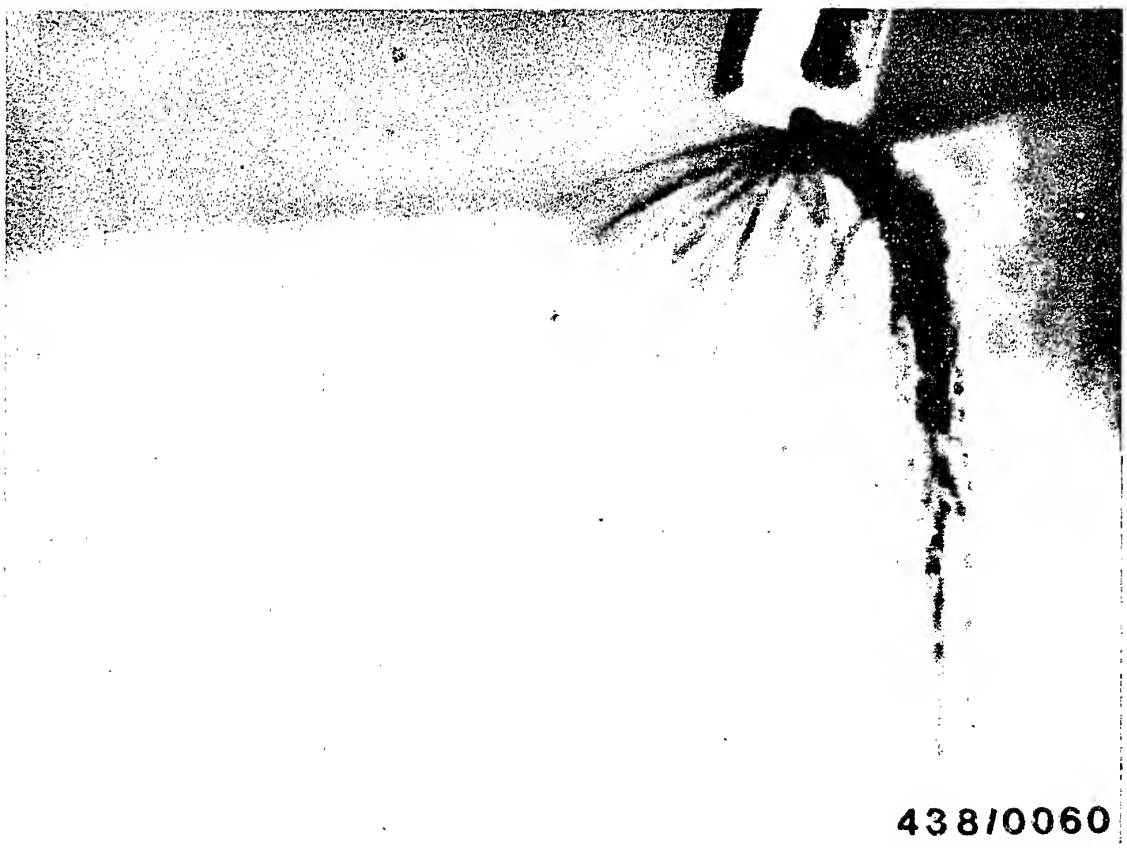
Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about 35° is permissible (see example given in illustrations).

Illustration shows good spray formation.



438/0059

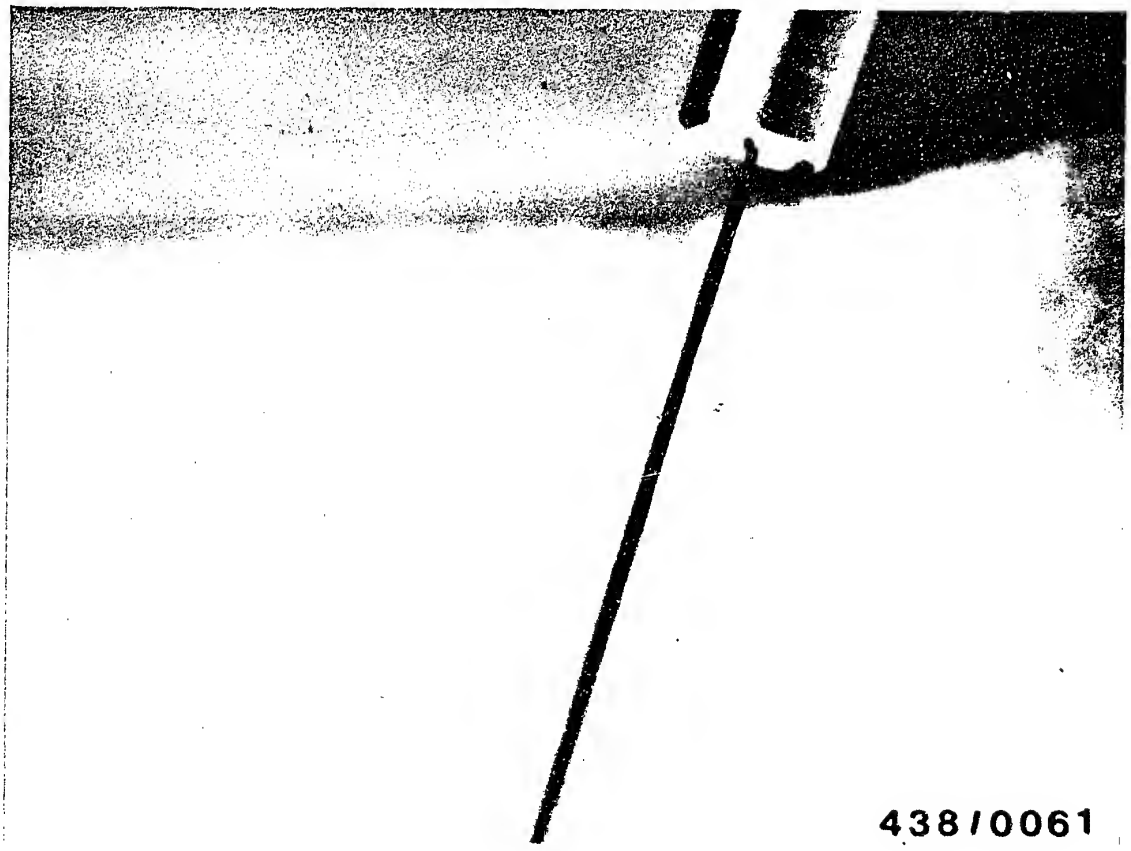
Illustration shows single-sided but nevertheless good spray formation.



438/0060

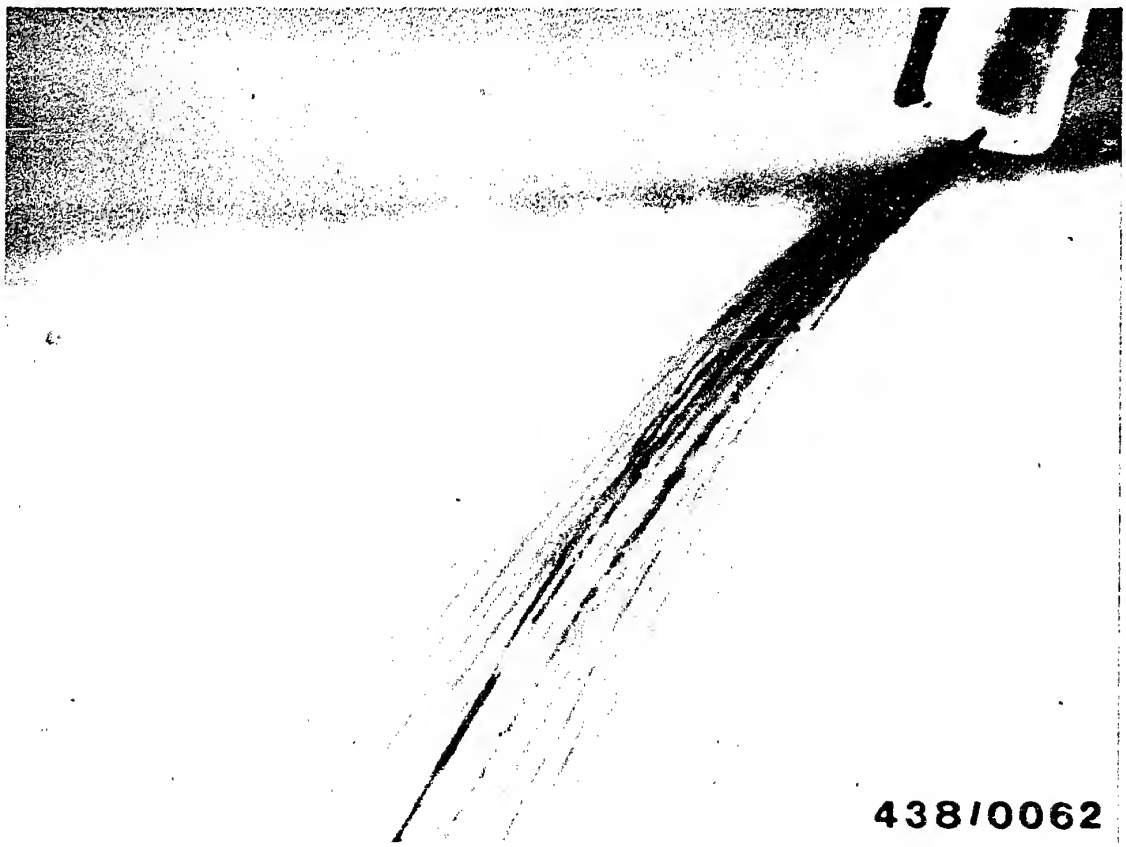
Poor spray formation; replace injection valves.

Illustration shows drop formation.



Poor spray formation; replace injection valves.

Illustration shows "cord" spray.

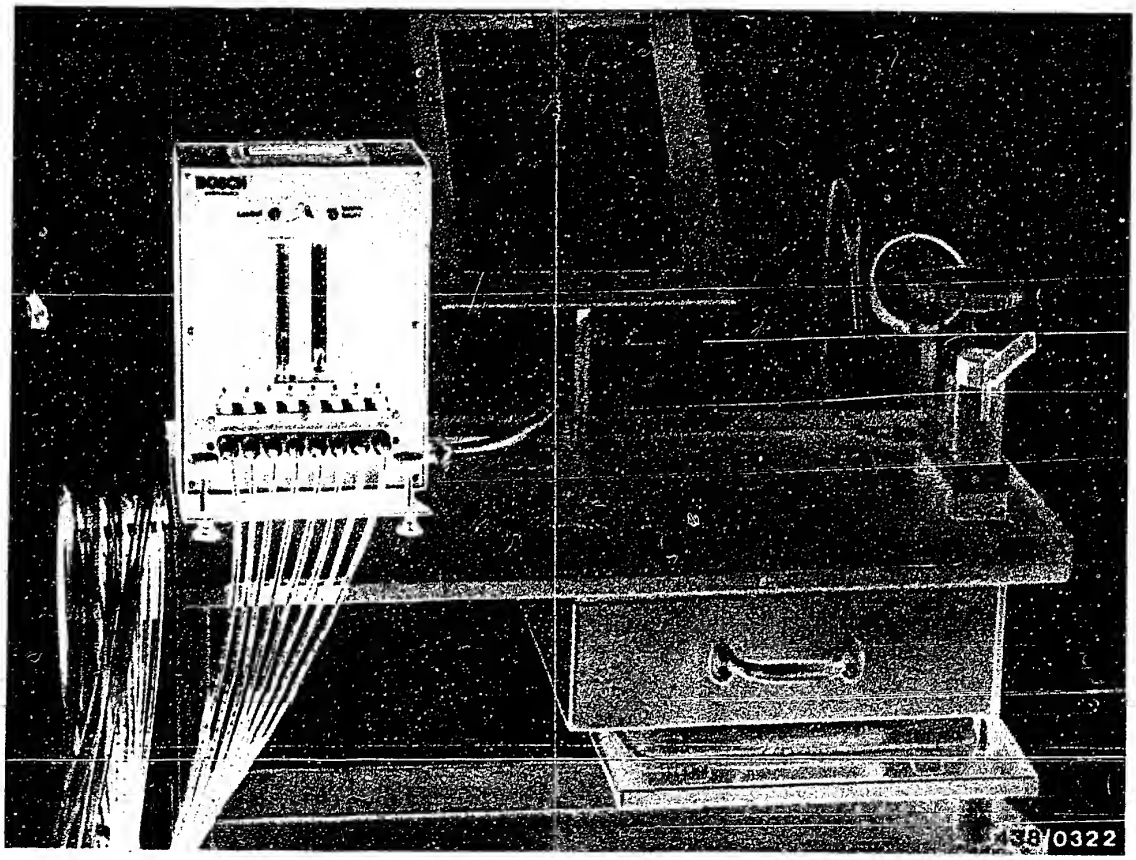


Poor spray formation; replace injection valves.

Illustration shows "spray in strands".

If defective injection valves have been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

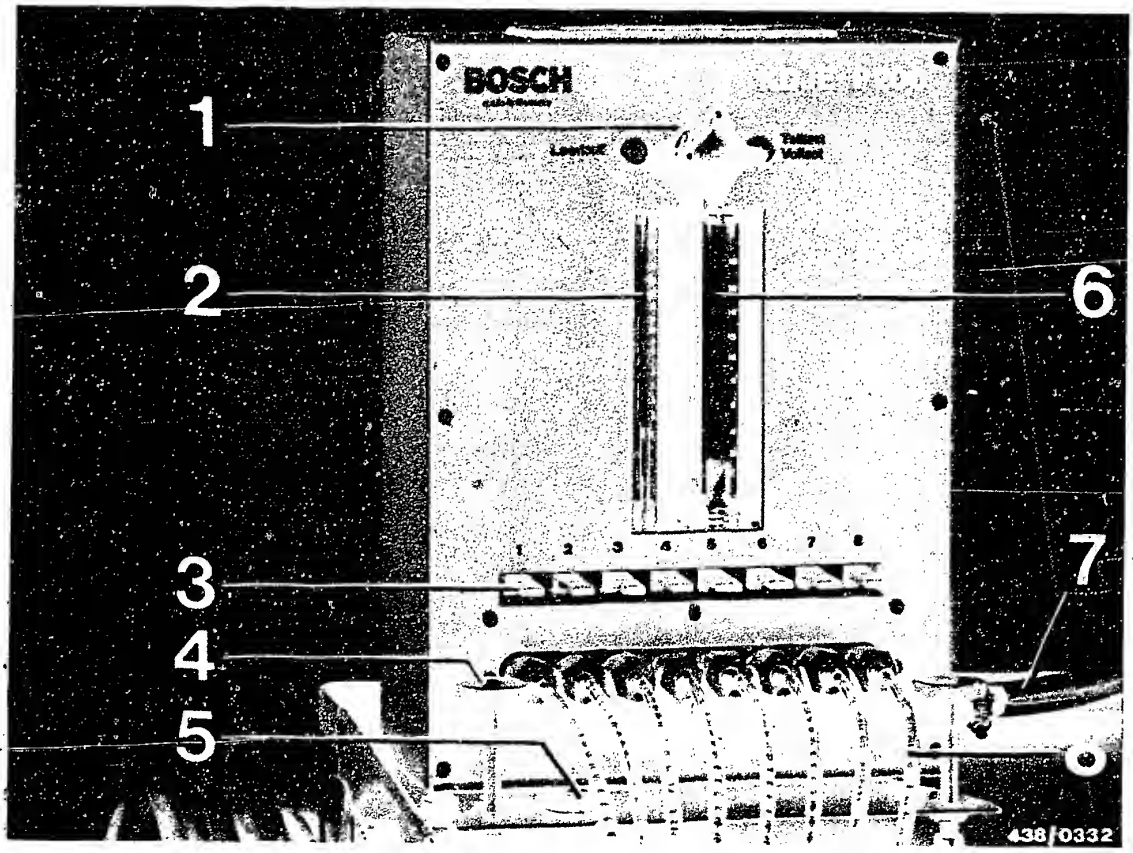
Idle-speed adjustment is described on Coordinates F 18.



19. Comparative measurement of fuel delivery of fuel distributor outlets.
This test is carried out using the tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).

19.1 Application

By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined.
The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.
Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.



1 = 3-way cock
2 = Small rotameter tube
3 = Keyboard for 8-way valve
4 = Adjusting screw for setting up
5 = Spirit level
6 = Large rotameter tube
7 = Return hose
8 = Polyamide hose lines (test lines)

19.2 Construction

The tester is designed for use with all engines, up to 8 cylinders, equipped with K-Jetronic.

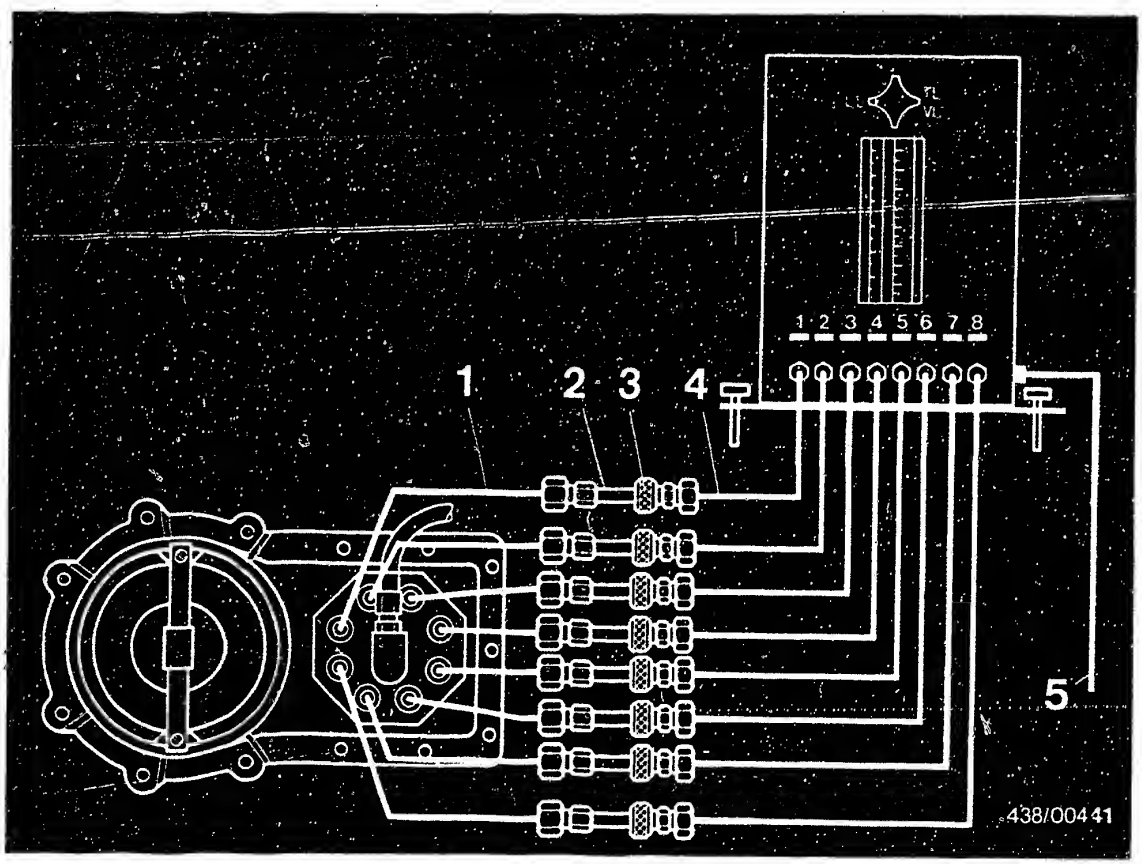
Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm^3 and 10...180 cm^3, an 8-way valve for key operation (Item 3) and a 3-way stopcock (Item 1).

The small rotameter tube (Item 2) is used for the idle measurement while the large tube (Item 6) is used to measure the fuel delivery at part- and full-load. The particular rotameter tube to be used is connected by means of the 3-way stopcock. Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other.

Attached to the tester are 8 hoses (Item 8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connector is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).

The fuel is returned to the fuel tank through a hose (Item 7) about 5 m long.

The entire test is made with a closed circuit, i.e. no fuel escapes.



1 = Adapter connection hoses from line set KDJE-P200/25
2 = Injection valves
3 = Automatic connectors
4 = Tester hoses
5 = Return line to fuel tank filler neck

19.3 Setting up and connecting the tester:

Set the tester up beside the engine on a solid base (e.g. on tester trolley KDJE-W 100) and align it with the built-in spirit level at the base of the tester.

So that the rigid fuel-injection tubing is not bent too much, the tester for delivered quantity comparison is connected using the adapter connection hoses KDJE-P200/25.

Remove the injection valves completely.

Unscrew the fuel-injection tubing from the fuel distributor and connect the adapter connection hoses instead.

Screw the injection valves onto the adapter connection hoses.

Clean the injection valves with a rag and insert injection valves into the automatic connectors of the first four tester hoses.

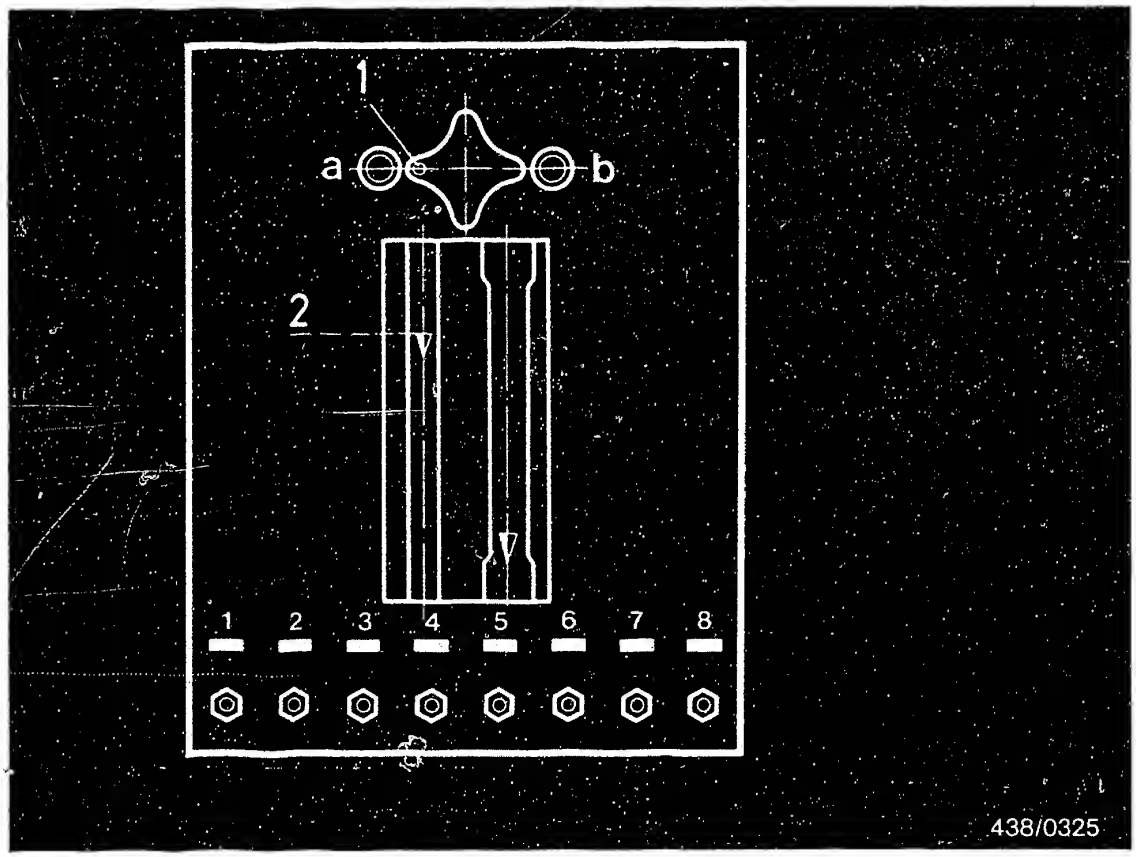
Note:
Insert the injection valves as far as they will go and tighten the knurled thumbscrews well so that the non-return valves of the automatic connectors are opened fully.

Introduce the return hose of the tester into the fuel tank filler neck.

19.4 Bleeding the tester:

Remove the air filter so that the air-flow sensor plate becomes accessible.
Disconnect the electrical connecting plug of the warm-up regulator.

Switch on the electric fuel pump by bridging the electrical safety circuit.
Press down the air-flow sensor plate to the stop.
Press the keys on the 8-way valve one after the other, while simultaneously switching the 3-way stopcock until both rotameter tubes are bled.
Return the sensor plate to the rest position.

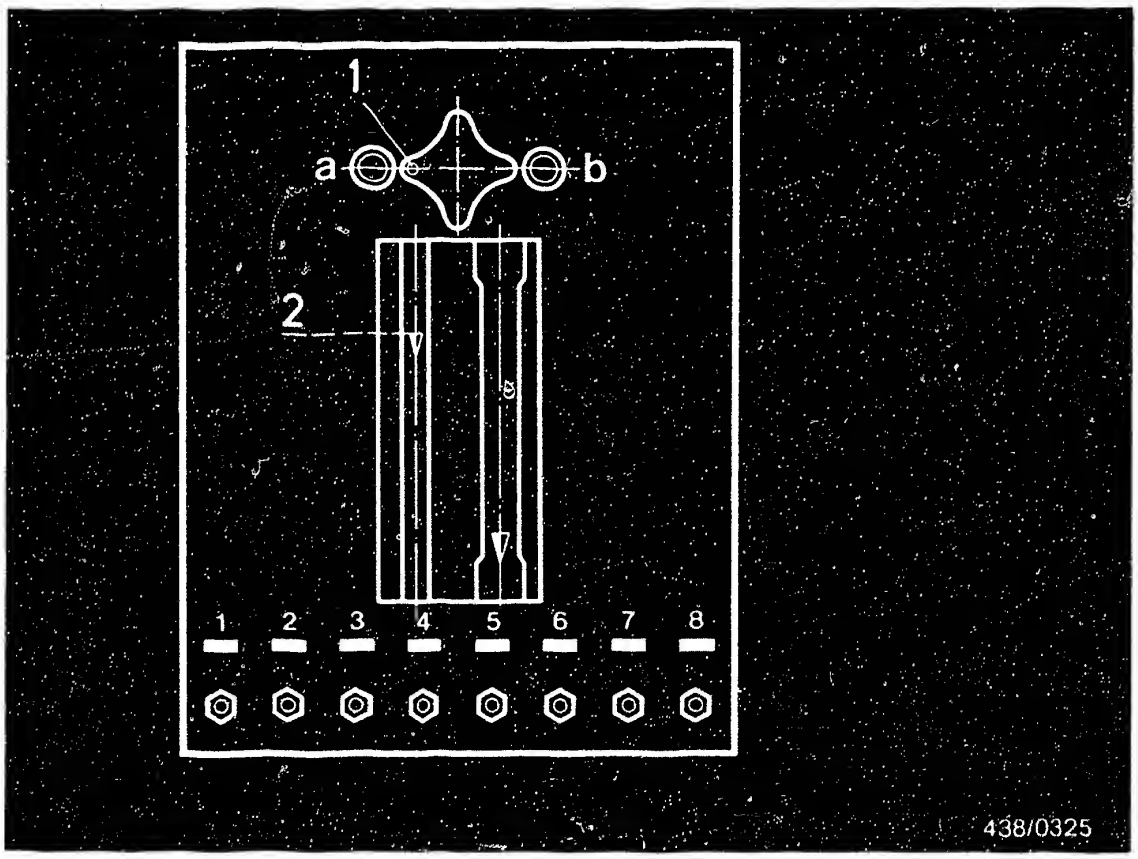


1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

19.5 Testing

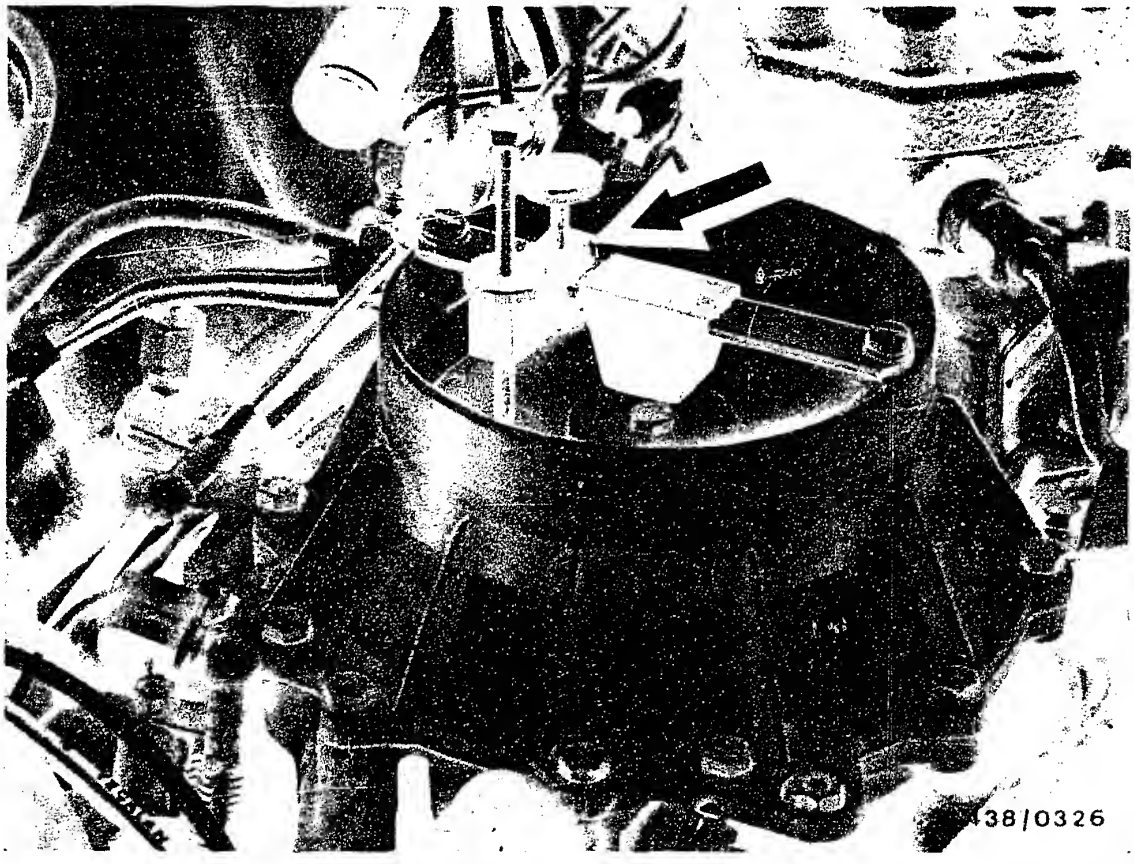
The flow comparison measurement is made in the idle, part-load and full-load ranges.
The small rotameter tube is to be used for the idle measurement (white dot to the left on control knob); part-load and full-load measurements are made using the large rotameter tube (white dot to the right).



1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

The delivered quantities indicated on the rotameter tubes are read off at the top edge of the conical float (Item-2). On testers with a ball float the uppermost point of the ball is used for reading off. With each measurement be sure to wait until the float has reached its final position. This may take 20 ... 30 seconds in the case of small deliveries.



The exact setting and locating of the position of the air-flow sensor plate for the various load ranges is done using the setting device KDJE 7456.

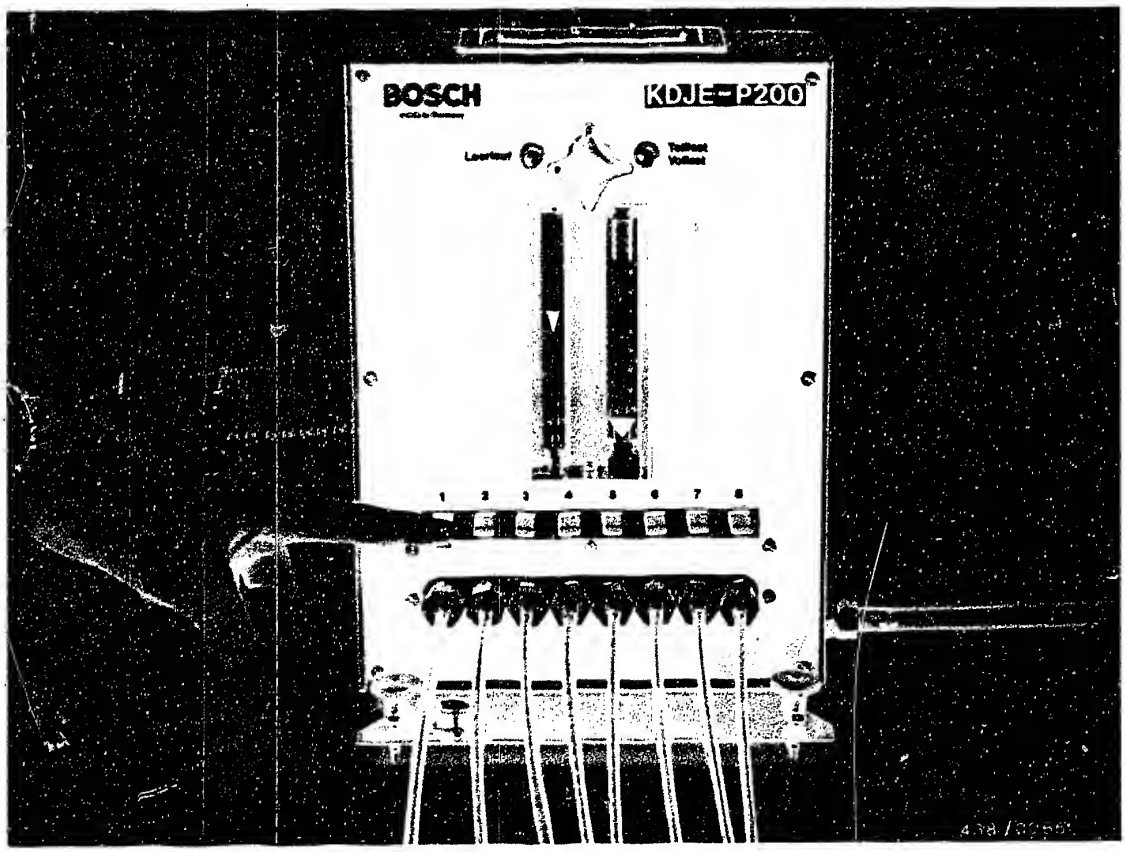
With the adjusting screw initially screwed all the way out, the setting device is clamped onto the stop bracket of the air funnel (arrow).
Adjust the position of the air-flow sensor plate using the adjusting screw.

Procedure:

Switch on the electric fuel pump by bridging the electrical safety circuit.

Fixed numerical values are specified in the following test section for the maximum permissible fuel delivery differences for the individual load ranges.

The "setpoint" value always pertains to the fuel-distributor outlet with the lowest fuel delivery, i.e. in each case the outlet with the lowest delivery is to be first ascertained.



Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the key for this outlet again, and set the delivery precisely to the "set point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set point".

19.6 Test specifications

Comparative measurement of the fuel deliveries from the outlets.

Fuel distributor No. 0 438 100 068 0 438 100 089	Setting point $cm^3/min.$	Max. allowable fuel delivery $cm^3/min.$
Idle	6.0	7.2
Part load	30.0	32.5
Full load	145.0*	160.0
Fuel distributor No. 0 438 100 111/... 112		
Idle	6.0	6.6
Part load	30.0	32.5
Full load	120.0*	132.0

* At least these full load setting deliveries must be attained with maximum deflection of the air-flow sensor plate.

If, in testing, a too large difference is ascertained in one of the three load ranges, the test should for safety's sake be repeated.

If the result is confirmed, you should check whether the fault lies in the fuel distributor or in the injection valves.

To do this interchange the injection valves with the greatest and smallest difference.

If the result is still the same, the fault is in the fuel distributor. If the fault follows the interchanged injection valves, it lies in the injection valves.

Change defective fuel distributor and/or replace defective injection valves.

19.7 Finishing up

Check the seal ring on the shaft of the fuel-injection valves for damage and deformation, and if need be use new specially-shaped seal rings (Mercedes-Benz service part).

Likewise check the air guide sleeves for leaks.

Remount the fuel-injection valves according to specifications. Likewise put on the air filter. Make sure all lines are laid correctly.
Reconnect the electrical safety circuit of the K-Jetronic according to specifications.
In a test run, check that none of the line connections leak.

Then check the idle adjustment and if need be, correct it (coordinates F 18).

20. Idle adjustment

20.1 Test conditions, general for all models:

- Warm the engine up for the idle adjustment (oil temperature approx. 80°C).

Important Note:

- If the fuel-injection tubing or injection valves were loosened or removed, the engine should be warmed up under load. The low rate of fuel flow during idling is not always adequate to drive all the air out of the fuel-injection tubing.
- The idle speed must not be adjusted when the engine is too hot, e.g. immediately after being raced or after a power measurement on the roller-type test stand.
- In vehicles with an air conditioner, this should be switched off to stabilize the engine speed during idle-speed adjustment.
- Measurement of engine speed using a separate tachometer.

Further requirements prior to performing the idle CO adjustment.

- The linkage for actuating the throttle valve must be adjusted so that the throttle valve is up against the idle stop free of tension.

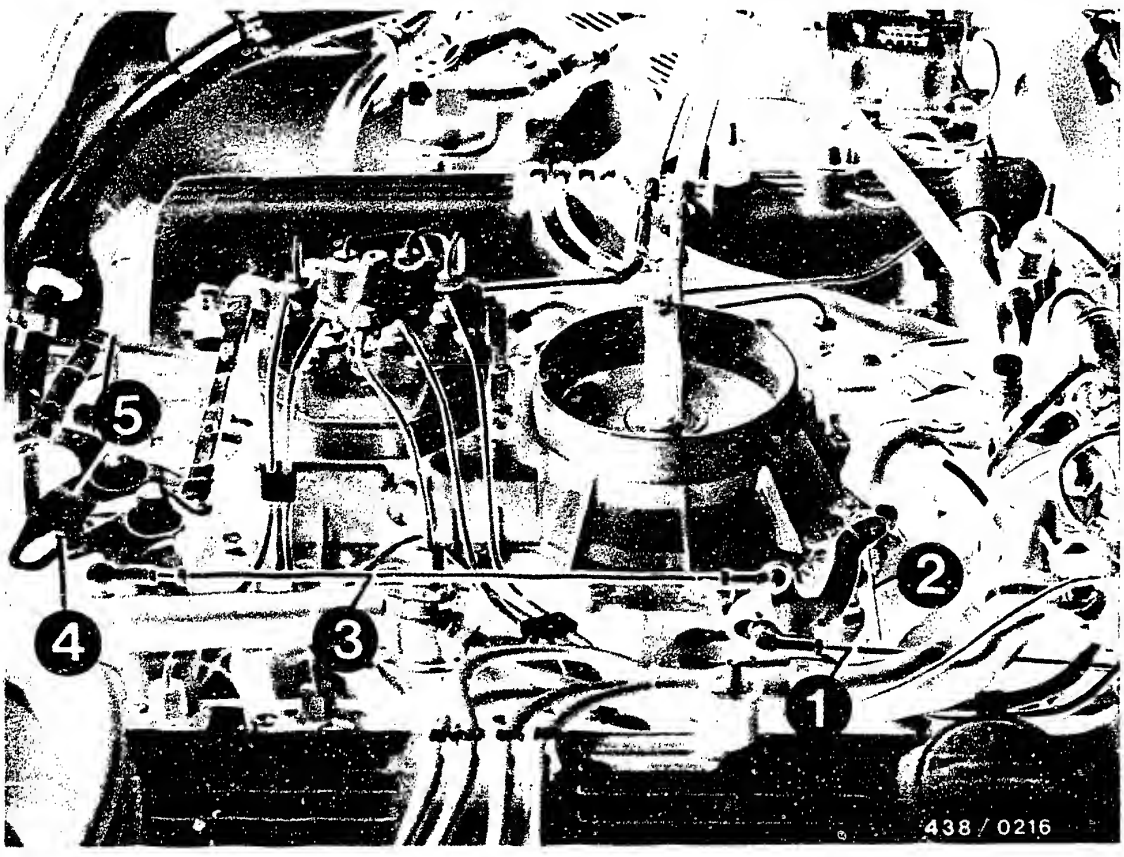
- The engines are equipped with exhaust-gas recirculation (for reducing the emissions).
  This system must be rendered inoperative in order to perform the idle CO adjustment.

- Idle speed with selector lever in position "P" or "N" and coolant temperature above 42°C:

  600...750 min^{-1}.

  The otherwise customary idle-speed adjustment is not performed since these vehicles are equipped with electronic idle-speed regulation (not made by Bosch). If the idle speed differs from the nominal value, check the idle-speed regulation system.

- For vehicles of the models for Sweden and Switzerland, switch off the secondary-air injection system.

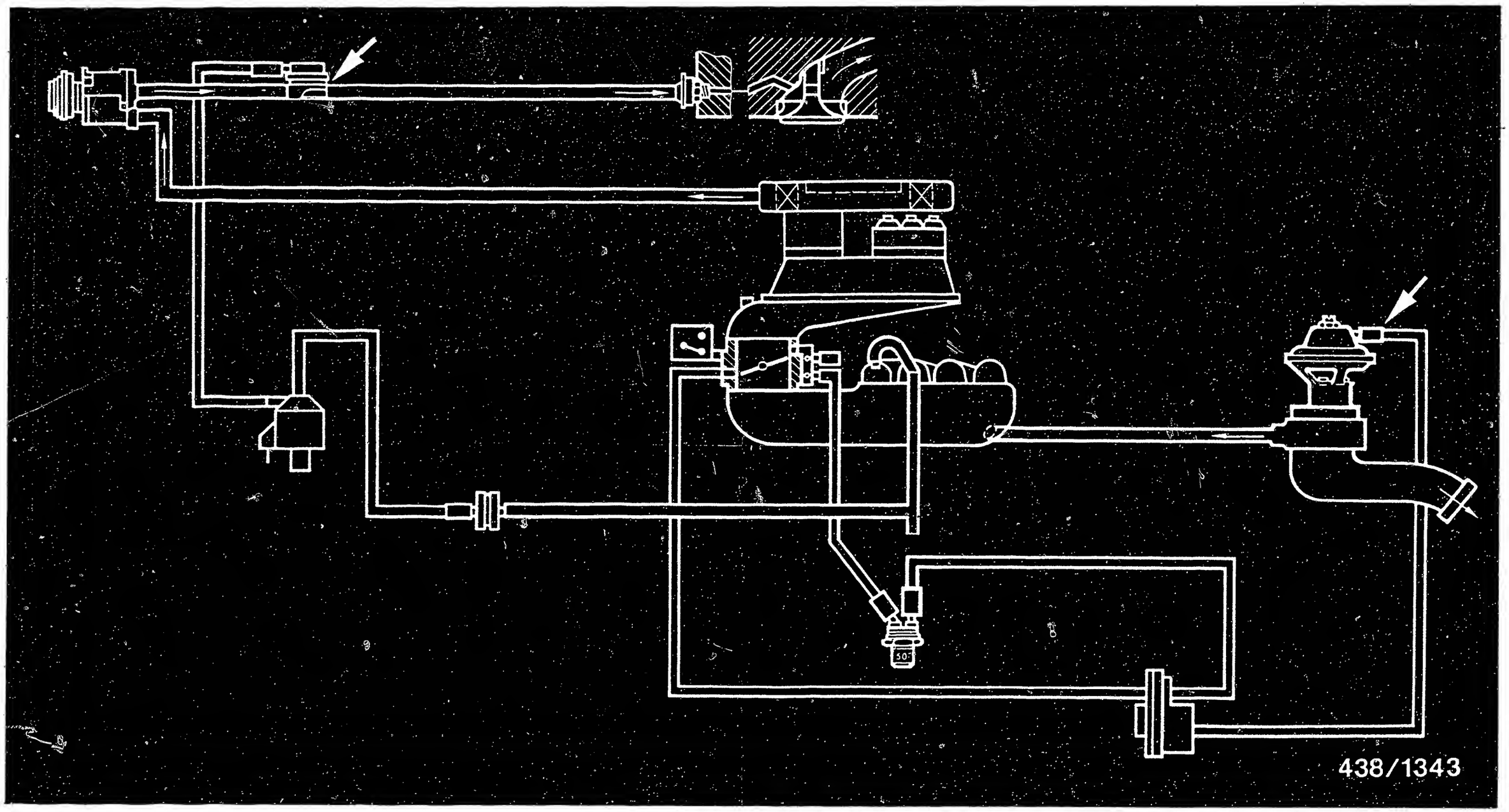


20.2 Adjustment of the throttle-valve linkage

In vehicles with an electric cruise control check whether the final controlling element is up against the idle stop.
If necessary, adjust the tie rod (1) so that, when it is hooked in, it forces the lever of the final controlling element about 1 mm away from the idle stop.

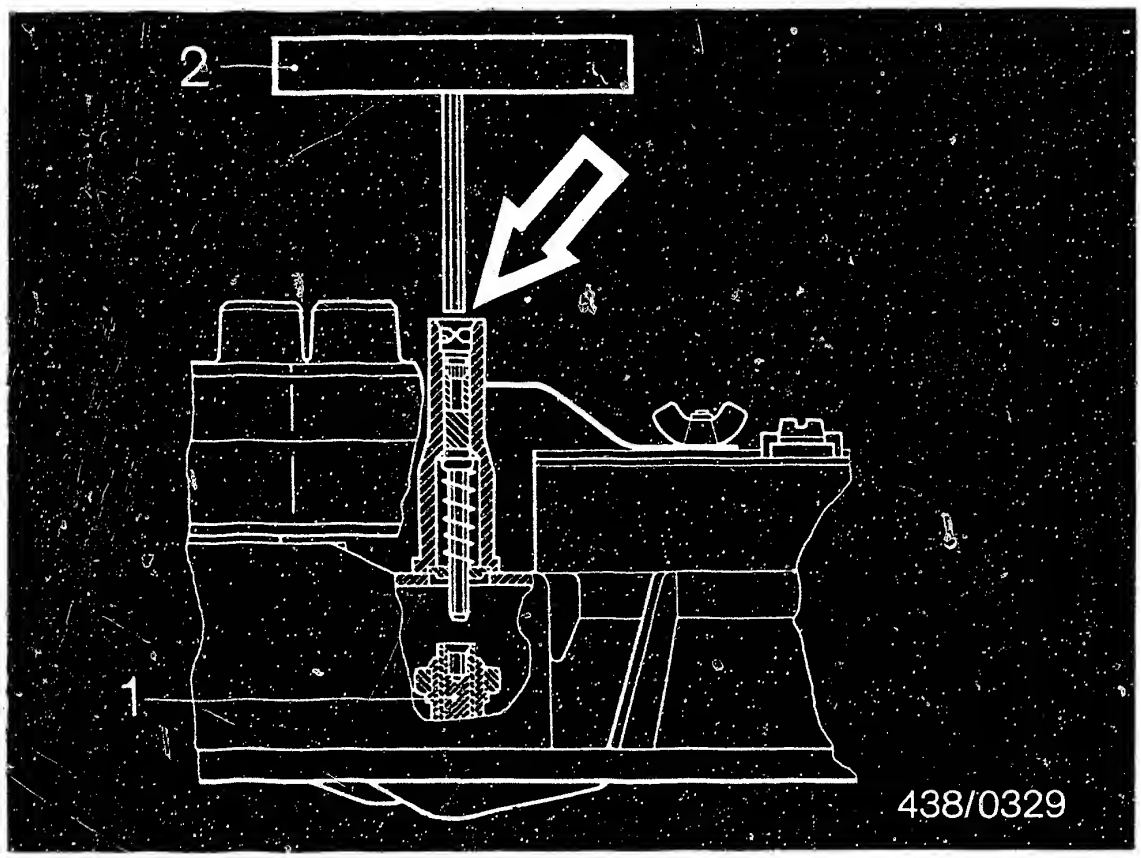
Unhook the connecting rod (2) from the throttle-valve assembly and check whether the throttle valve is up against the idle stop.

Hook the connecting rod back in so that it is free of tension. To do this, adjust the cross-rod (3) so that the roller (4) in the variable-fulcrum lever (5) is up against the end stop free of tension.



20.3 Switching off the exhaust gas recirculation and secondary air injection.

These vehicles are equipped with the above emission control equipment.
These units must not be operating when checking or adjusting the idle. For this purpose, disconnect the hoses (arrows) of the intake manifold control pressure and the secondary air and seal tightly the ends of the hoses and the connecting fittings.



20.4 Adjusting the CO concentration

Adjust the CO concentration in the exhaust gas at the idle-mixture-adjusting screw (1) in the mixture-control unit.
The CO concentration is adjusted with the air filter fitted. The adjusting wrench KDEP 1035 (2) is inserted through the specially provided opening in the air filter (arrow).
The idle-mixture-adjusting screw is adjusted via a setting device rigidly fitted on the mixture-control unit with a spring-loaded hexagon-socket key.
To make the adjustment, carefully press down the hexagon-socket key of the setting device using the adjusting wrench until it locks in position in the idle-mixture-adjusting screw. Remove adjusting wrench after each adjustment. The hexagon-socket key is forced upwards by the built-in spring and automatically seals off the hole leading to the idle-mixture-adjusting screw by means of an O-ring seal.

Turning to the right = richer mixture
Turning to the left = leaner mixture

Caution:
Always make the adjustment from the lean side, i.e. if the mixture is too rich turn the idle-mixture-adjusting screw further to the left than necessary and then turn it to the right up to the setting required.

After every adjustment remove the adjusting wrench and accelerate the engine briefly, so that the air-intake system can cool off. Then wait until the indicator of the CO tester has stabilized. Never accelerate the engine with the wrench still in place as this could result in bending the control lever in the air-flow sensor.

20.5 Anti-tamper device for idle-mixture screw:

In the Federal Republic of Germany, in accordance with an order for amending the Road Traffic Registration Code, § 47, Exhaust Gases and Their Discharge, has been amended. This order was printed in full in the Verkehrsblatt 13 of 15 July 1975.

Accordingly, all motor vehicles with externally suppliec ignition produced as of 1 October 1976 must be provided with anti-tamper devices for the idle-mixture-adjusting screw so that it is not possible to adjust the screw without destroying the anti-tamper device. The intention is to prevent non-experts from re-adjusting the idle setting and thus inadmissibly influencing the exhaust gas. Consequently, the anti-tamper caps may only be used in the workshop and must not be sold to customers for their own use.

These anti-tamper caps come in different colours. Use the following cap and colour for the after-sales service:
In the downdraft air-flow sensor:
Blue anti-tamper cap (not obtainable from Bosch).
Part No. of Daimler Benz 000.997. 5986
Of Deutsche Vergaser Gesellschaft: K 34 520

The housing bore (for receiving the adjusting wrench) is sealed by a plug.
The anti-tamper device is removed and fitted using special tools (e.g. tool set No. 4521/7 from Hazet Co.. 5630 Remscheid).

20.6 Test specifications and setting values for idle:

Conditions:

- Engine at normal operating temperature, oil temperature approx. + 80°C.
- Air conditioner turned off.
- Exhaust gas recirculation and secondary air injection not operating.

Idle speed:

3.8 l:	700...800 min^{-1}*
5.0 l:	600...750 min^{-1}

CO content:

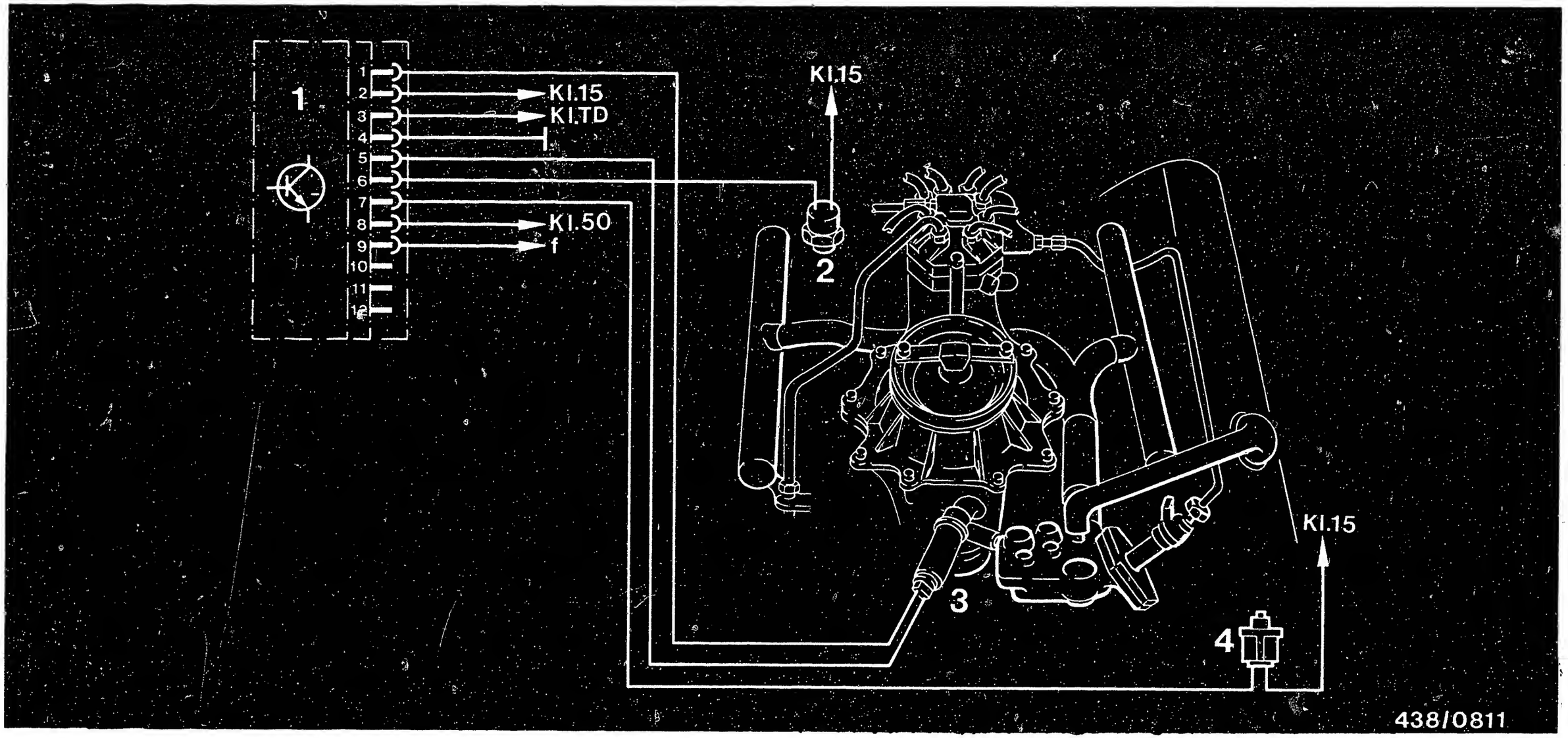
3.8 l / 5.0 l:	0.7...1.3 vol%CO

Then reconnect the vacuum control line to the non-return valve on the exhaust gas recirculation.
Likewise connect the hose for the secondary air injection.

* With selector lever in position "P" or "N" and coolant temperature above 42°C.

  Owing to the electronic idle-speed regulation system, it is not possible to adjust the idle speed.

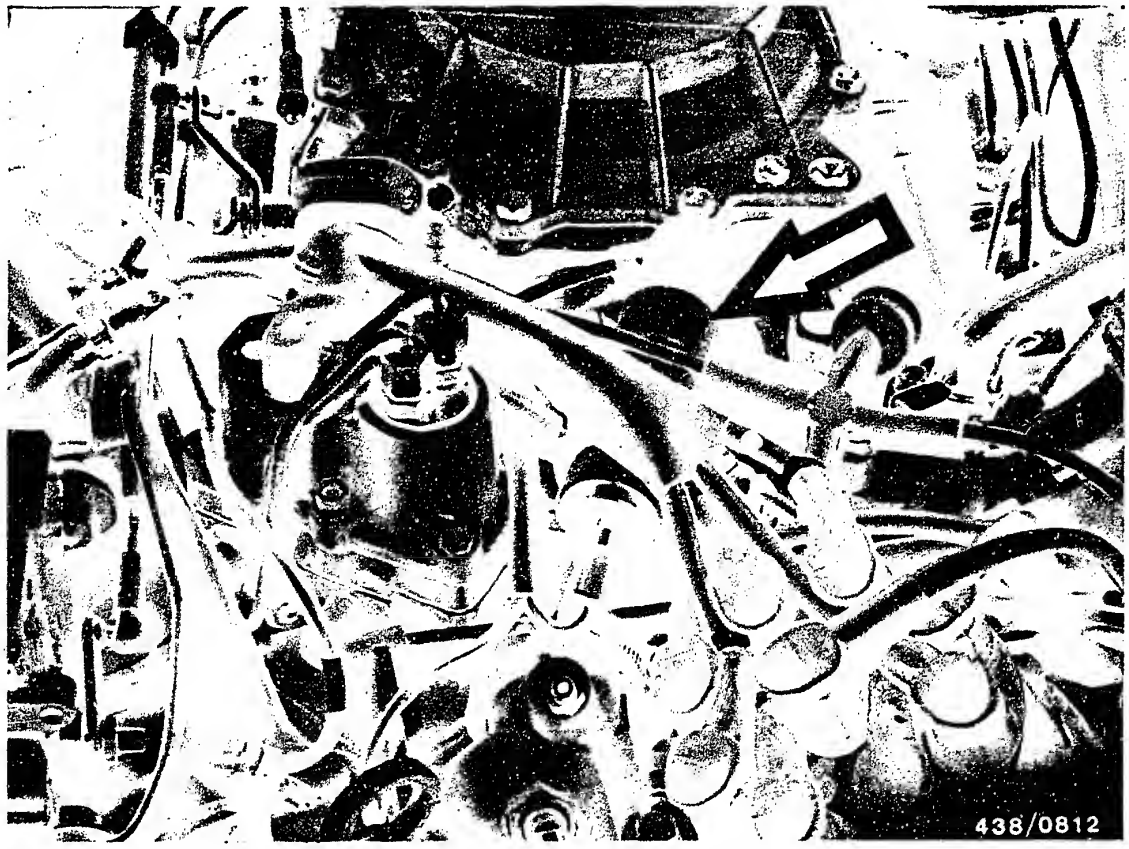
  If the idle speed is incorrect, check the idle-speed regulation system.



1 = Control unit 2 = Thermo-switch 3 = Idle controller 4 = Throttle-valve switch 5 = Air conditioner

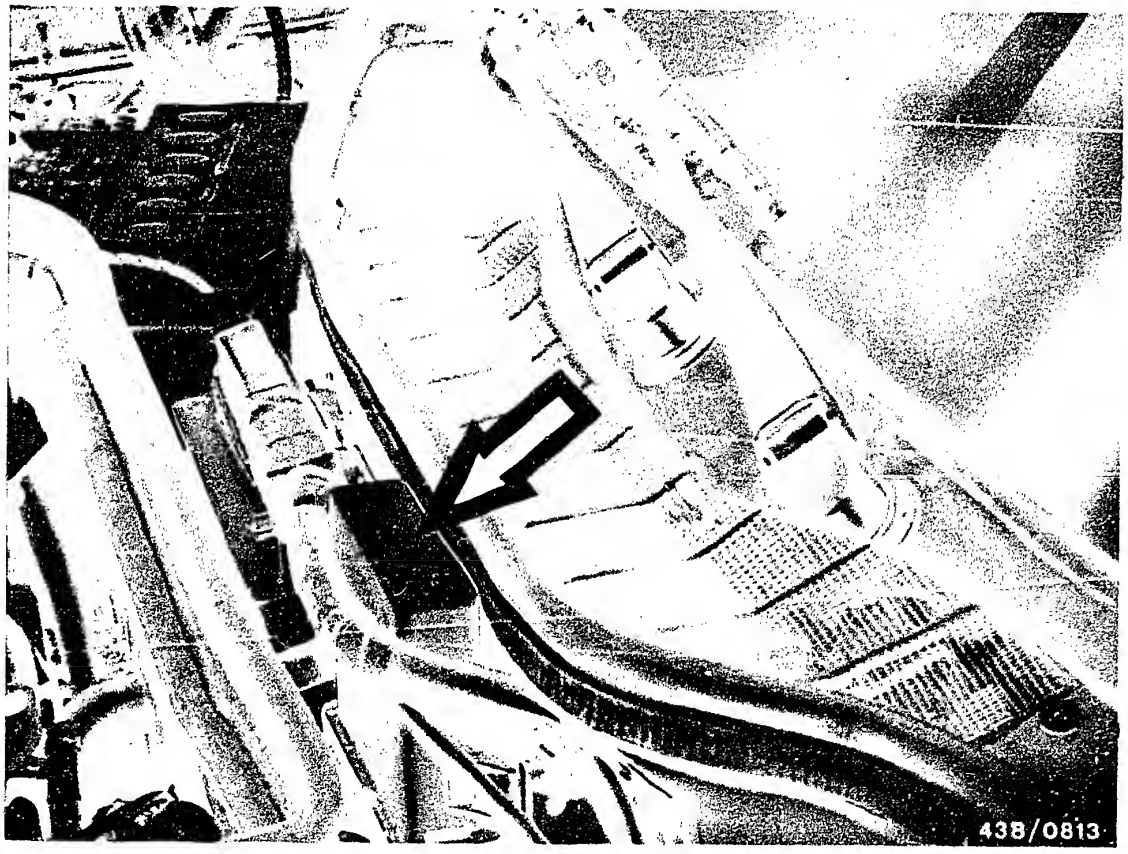
21. Idle-speed regulation (not made by Bosch)

Operation
The idle speed is regulated by the electronic control unit and the idle controller. The idle controller is positioned in the air bypass to the throttle valve in place of the usual auxiliary-air device.
The control unit supplies the tractive electromagnet of the idle controller with a pulsed voltage with a frequency of approx. 200 Hz, as a result of which the blocking plate in the air duct is moved, thus changing the air throughput.



Arrow = Idle controller

The ACTUAL engine speed is derived from the ignition pulses (TCI terminal TD); the ACTUAL engine speed is compared in the control unit with a NOMINAL engine speed and the idle controller is energized accordingly.



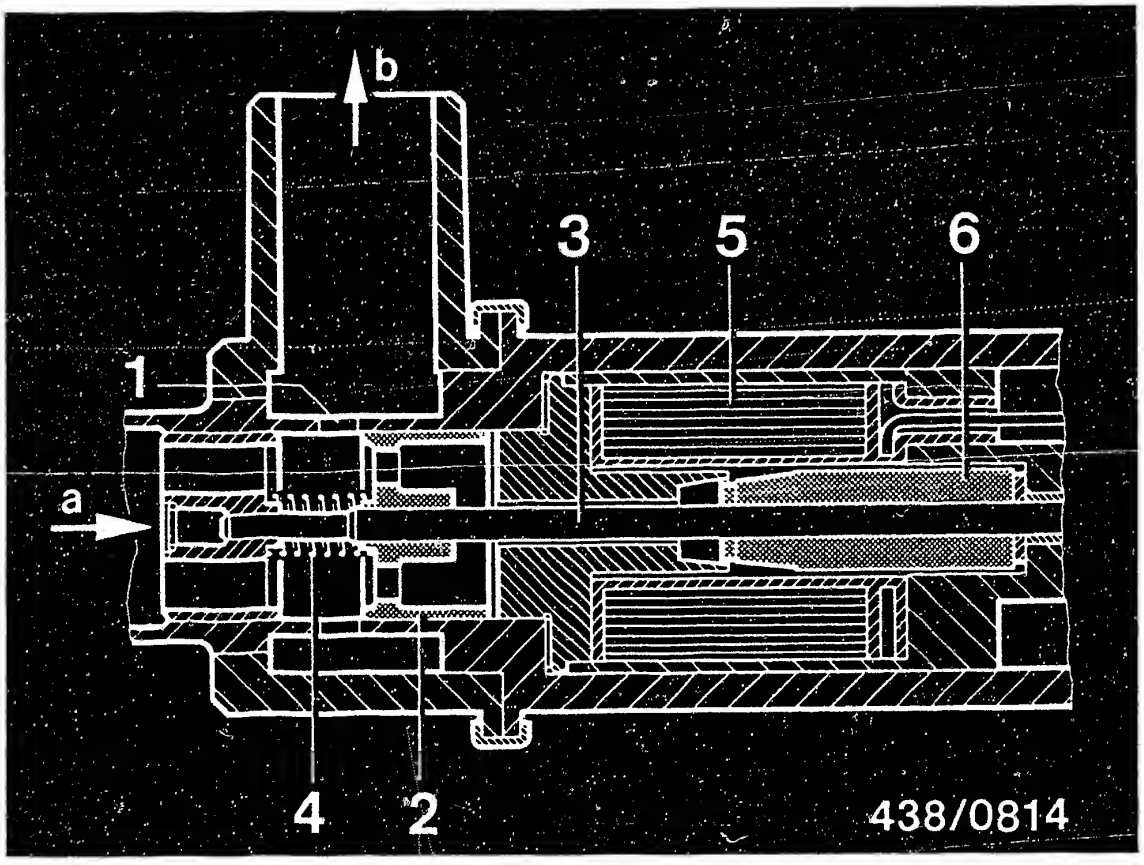
Arrow = Control unit

Components of the idle-speed regulation system:

- Control unit, processes the input information and energizes the idle controller
- Idle controller, changes the air throughput
- Thermo-switch, 42°C in coolant system
- Throttle-valve switch to identify idle and part load

Functions of the idle-speed regulation system:

- Engine speed (TCI terminal TD)
- Selected drive mode
- Switching on of the refrigerant compressor.



1 = Blocking plate
2 = Piston
3 = Shaft
4 = Compression spring
5 = Solenoid
6 = Magnetic core
a = Air inlet
b = Air outlet

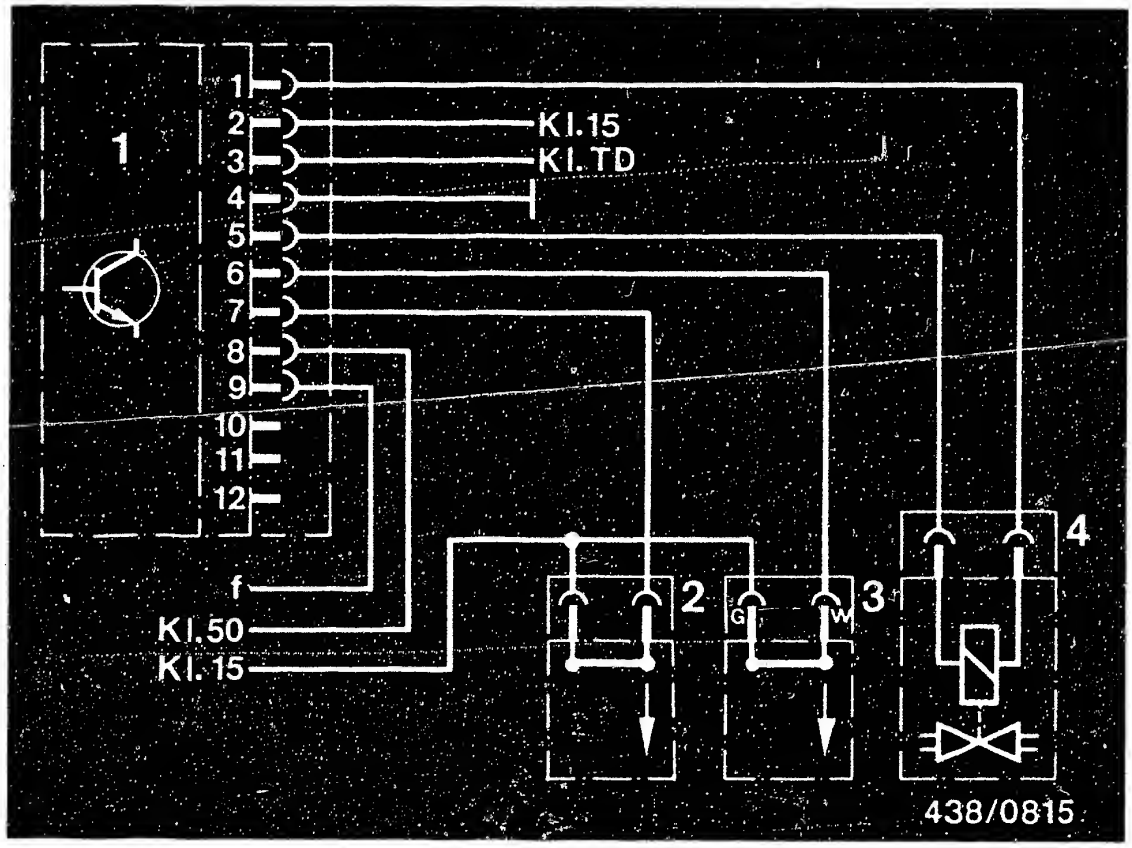
Idle controller

Blocking plate is open to the maximum:

- With ignition switched off
- With ignition switched on and engine stopped, (Voltage at idle controller approx. 0.5...1.5 V.)

Blocking plate is closed:

- With approx. 5 V at idle controller
- at idle, the idle actuator operates at approx. 4...5 V, approx. 1100 mA.



1 = Control unit
2 = Throttle-valve switch
3 = Thermo-switch
4 = Idle controller
f = To air conditioner

- Electrical circuit diagram

- Test specifications for regulated idle speeds:

Drive mode	Coolant temperature	Idle speed
Out of gear	>42°C	600...750 min^{-1}
	<42°C	750...850 min^{-1}
In gear	>42°C	500...600 min^{-1}
	<42°C	650...750 min^{-1}

Information on testing

- Test the power supply to the control unit:
  at terminal 2 = Positive from terminal 15
  at terminal 8 = Positive from terminal 50
  at terminal 4 = Ground

- Test the leads from the control unit to the components:

  from terminal 1 - to idle controller
  from terminal 5 - to idle controller
  from terminal 3 - to terminal TD of TCI
  from terminal 6 - to thermo-switch
  from terminal 7 - to the throttle-valve switch
  from terminal 9 - to air conditioner

- Check voltage supply from Terminal 15 to the e thermo-temperature and throttle-valve switch.

- Ignition switched on, engine stopped:

  Remove connector from idle controller; the idle controller must be heard to switch.
  If not, check voltage at connector.
  Test specification: approx. 0.5...1.5 V.
  If voltage present, replace idle controller.
  If no voltage present, replace control unit.

- Enging running at idle speed:

  Remove connector from idle controller. The engine speed thereby increases to approx. 1500 min^{-1}.
  If not, replace idle controller.

  Set selector lever to drive position. The engine speed must thereby drop to approx. 500 min^{-1}.
  If not, replace control unit.

  Disconnect the clutch from the throttle-valve switch. As a result, the engine speed increases by approx. 200 min^{-1}. If not, take out and replace the throttle-valve switch.

  Remove connector from thermo-switch and bridge contact. The engine speed thereby increases to approx. 900 min^{-1}.
  If not, replace thermo-switch.

22. Emission control

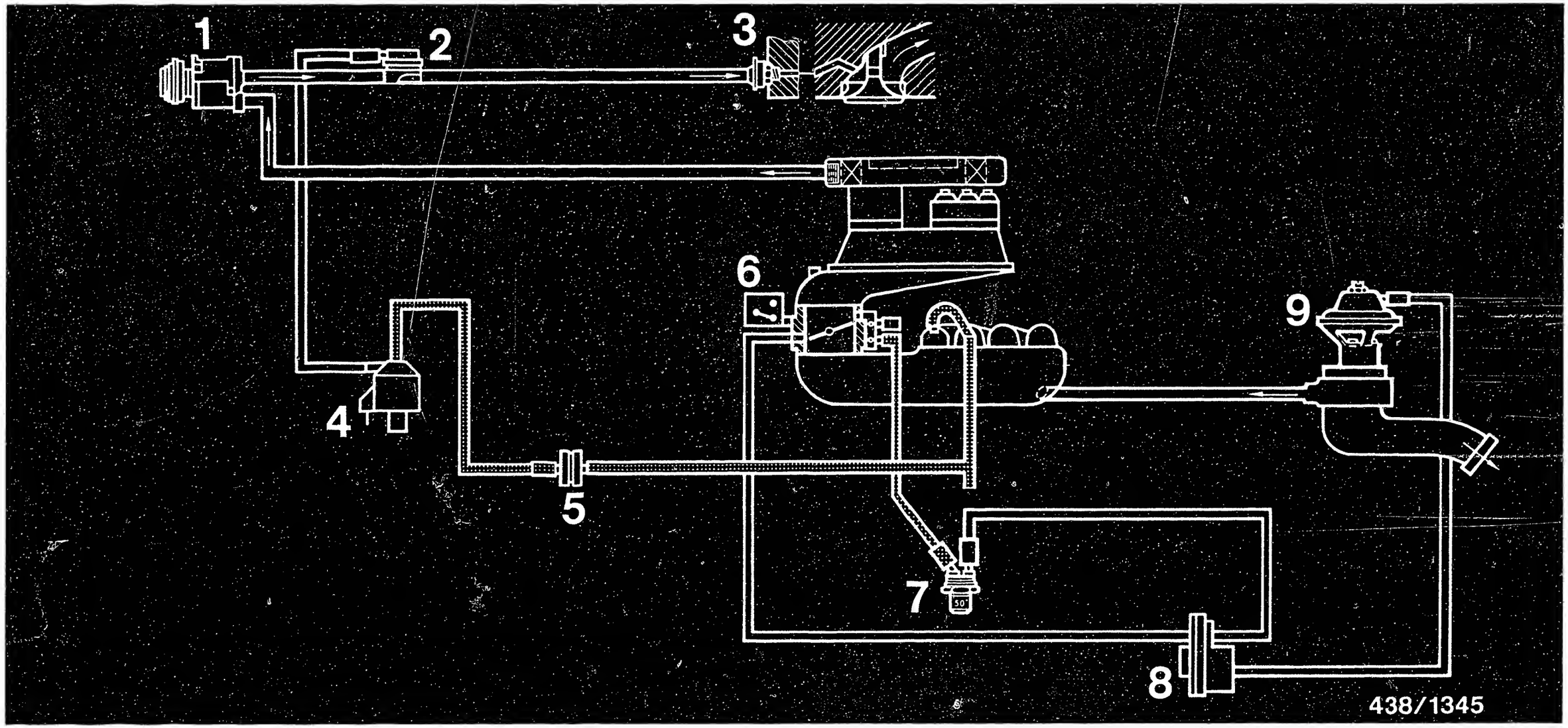
The vehicles have the following equipment:

- Exhaust gas recirculation
- Vehicles in the model Sweden and Switzerland have, in addition, secondary air injection.

The exhaust gas recirculation reduces the proportion of noxious material in the exhaust gas.

Some of the CO and CH residues are afterburned as a result of the secondary-air injection.

All systems (non-Bosch products) affect not only the composition of the exhaust gas, but also fuel consumption and power output.
Their structure, function, and line diagrams are explained in the sections below.



21.1 Diagram of air lines

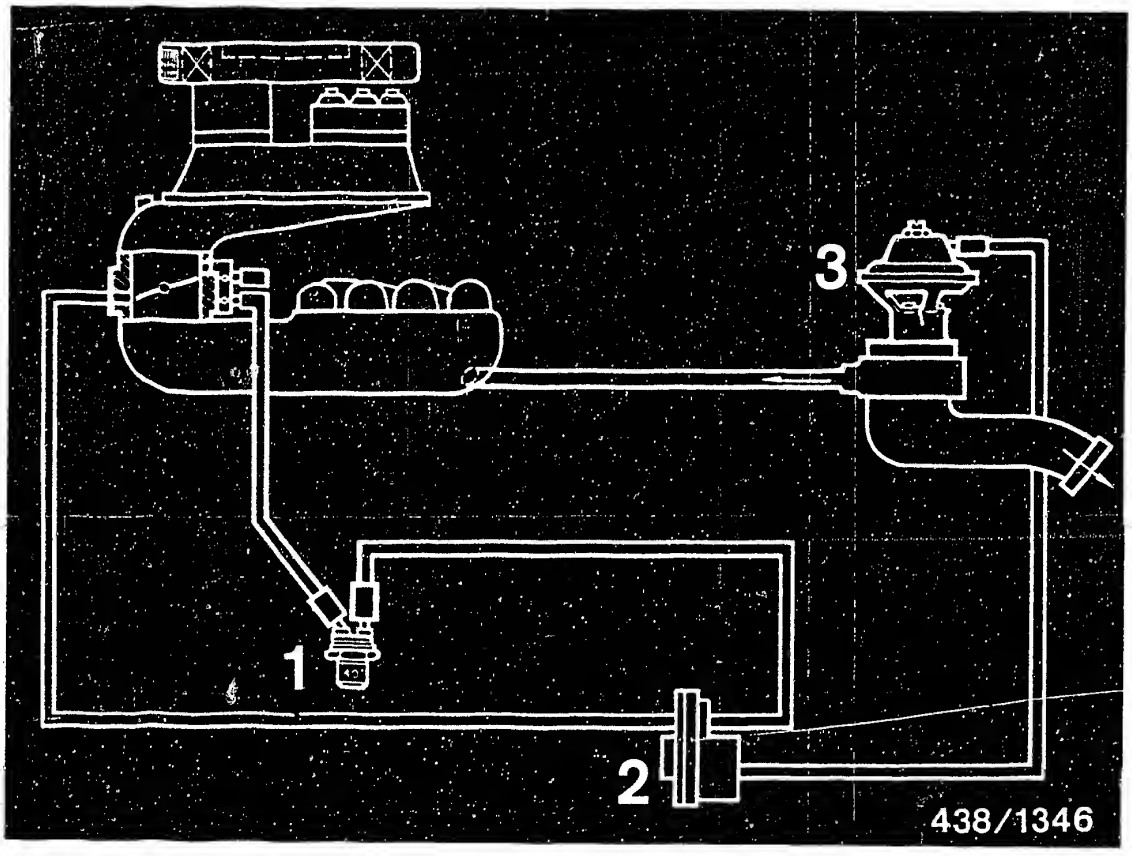
- Secondary-air injection

1 = Air pump
2 = Air cutoff valve
3 = Non-return valve
4 = Changeover valve
5 = Non-return valve
6 = Throttle-valve switch

- Exhaust gas recirculation

7 = Thermovalve + 40°C
8 = Vacuum control valve
9 = Exhaust gas recirculation valve

= continually present intake manifold pressure



1 = Thermovalve + 40°C
2 = Vacuum control valve
3 = Exhaust gas recirculation valve

22.2 Exhaust gas recirculation (non-Bosch part)

A portion of the exhaust gas is returned via the vacuum-controlled exhaust gas return valve to the intake manifold, where it takes part once again in the combustion process.
Exhaust gas is afterburned in the part load range only when the engine is warm, depending on the throttle-valve setting and the engine temperature (thermovalve).

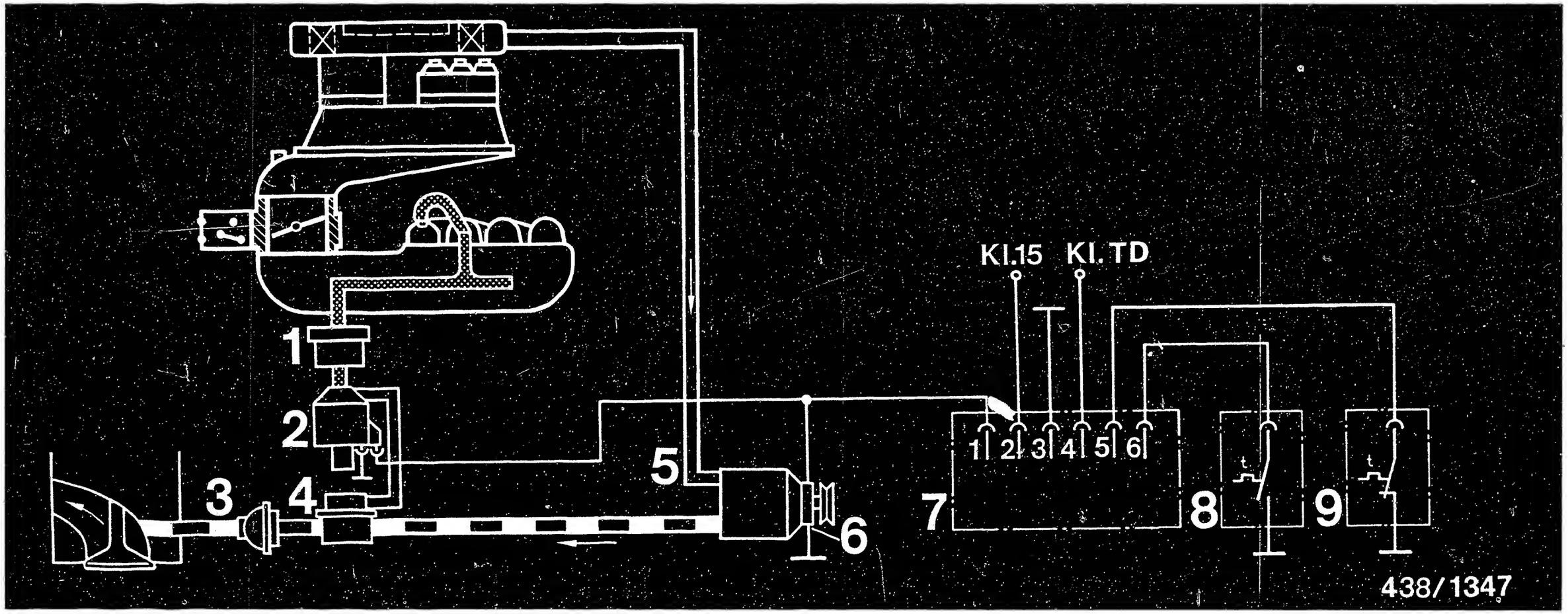
The exhaust gas recirculation system does not operate at idle or full load or when the engine is cold.

Installation position and function of the components

- Vacuum control valve:
  Located next to the starting valve.
  It combines a non-return valve and a bypass valve.

- Thermovalve:
  Fastened next to the warm-up regulator.
  It opens at approx. + 40°C coolant temperature.

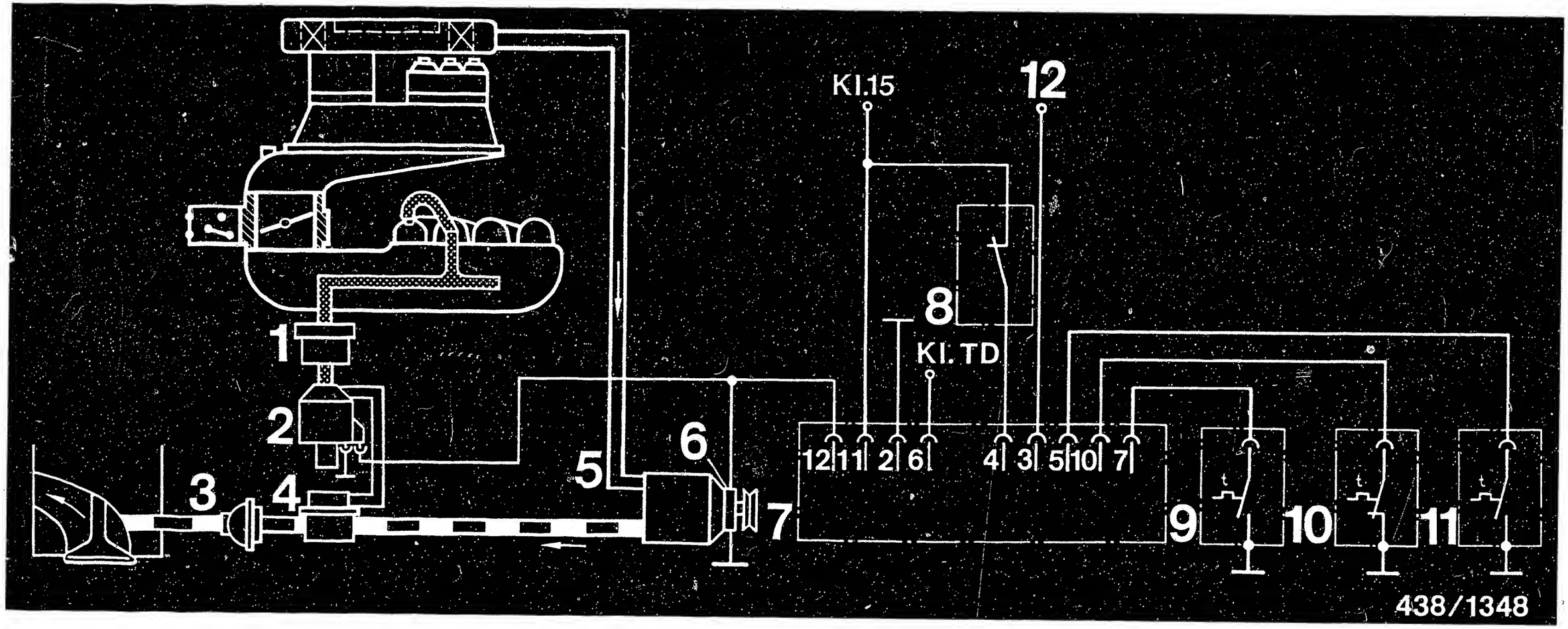
- Exhaust gas recirculation valve:
  Flanged on to the exhaust manifold.
  It opens corresponding to the triggering from the intake manifold pressure in the part load range and directs some of the exhaust gas back into the intake manifold.



1 = Non-return valve
2 = Changeover valve
3 = Non-return valve (air)
4 = Air cutoff valve
5 = Air pump
6 = electromagnetic clutch
7 = Control unit
8 = Temperature switch + 100°C
9 = Temperature switch + 16°C
= continual intake manifold pressure
= secondary air

22.3 Secondary-air injection (non-Bosch part)

• 3.8 l / 8 cyl. engine
Acting across the air cutoff valve and a non-return valve, the air pump pushes fresh air into the exhaust flow. The proportion of noxious materials in the exhaust gas is reduced as a result of the afterburning.
Dependent on the engine speed (control unit), and the engine temperature (temperature switches), the air-injection system operates only when the engine is warm (above + 16°C oil temperature, and below 100°C coolant temperature) and at an engine speed less than 2300 min^{-1}.
The air-injection system does not function when shifting into overrun operation.



1 = Non-return valve
2 = Changeover valve
3 = Non-return valve (air)
4 = Air cutoff valve
5 = Air pump
6 = electromagnetic clutch
7 = Control unit
8 = Throttle-valve switch
9 = Temperature switch +100°C
10 = Temperature switch + 16°C
11 = Temperature switch + 65°C
12 = electronic tachometer

= contiunal intake manifold pressure
= secondary air

• 5.0 l / 8-cyl. engine

The operation of the secondary-air injection system in a 5.0 l engine corresponds to that of the 3.8 l engine.
In addition, there is the shutoff of the secondary-air injection: above + 65°C oil temperature and above approx. 65 km/h driving speed.
The secondary-injection system turns back on:
if for 45 s, speed has dropped by 5 km/h and the driver steps on the gas.

Installation position and function of the components

- Non-return valve:
  Located next to the starting valve.

- Changeover valve:
  Fastened on the left bulkhead.
  Is supplied with a current from the control unit when the engine is warm and the rotational speed is less than 3000 min^{-1}.
  The air for the air-injection is pushed in by engaging the air pump and opening the air shutoff valve.

- Non-return valve (air):
  Prevents hot exhaust gases from getting into the secondary-air injection unit.

- Air shutoff valve:
  Attached behind the oil filter.
  Controlled by intake manifold pressure, it opens the passage for air from the air pump to the exhaust pipe.

- Electromagnetic clutch:
  Fastened to the air pump.
  Connects the drive to the air pump when voltage is being supplied by the control unit.

- Control unit:
  Bolted on behind the side panel in the footwell on the front passenger's side
  With an engine temperature of + 16°C and an engine speed less than 3000 min^{-1}, the control unit supplies voltage to the changeover valve and the electromagnetic clutch.

- Temperature switch +16°C:
  Flanged on next to the oil filter.
  Operating via the control unit, it interrupts the air injection at temperatures less than 16°C.

- Temperature switch + 65°C oil:
  Attached next to the oil filter.
  It breaks off the air injection at temperatures above + 65°C.

- Temperature switch + 100°C water:
  Fastened next to the warm-up regulator.
  It breaks the ground connection to the control unit at temperatures less than approx. + 100°C.

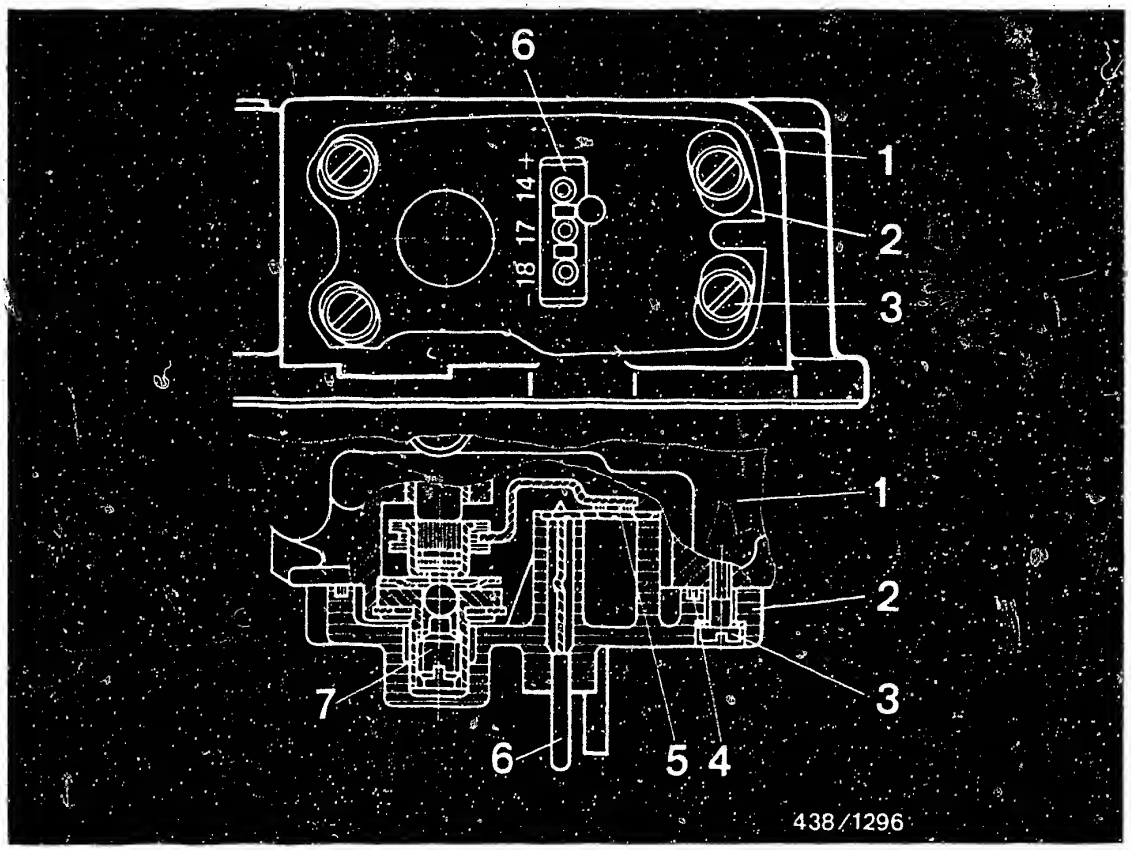
23. Air-flow sensor with potentiometer

23.1 Structure, function

The air-flow sensor 0 438 121 019 of the mixture-control unit 0 438 080 020 is equipped with an angle sensor to indicate the fuel consumption in the trip computer.

The angle sensor, built as a potentiometer, is attached to the fixed bearing of the air-flow sensor housing.

It consists of a fixed potentiometer housing and a rotating brush-type wiper.



1 = Air-flow sensor housing
2 = Potentiometer housing
3 = Fillister-head screw
4 = Gasket
5 = Brush-type wiper
6 = 3-pin plug connection
7 = Fixed bearing

The potentiometer is supplied with a 5 volt DC current across the 3-pin plug connection. At the outlet, there is available a current of between 0 volts and 5 volts corresponding to the position of the air-flow sensor plate (idle, part load, full load).
This load-dependent voltage is evaluated by the trip computer for displaying the fuel consumption rate.

23.2 General instructions

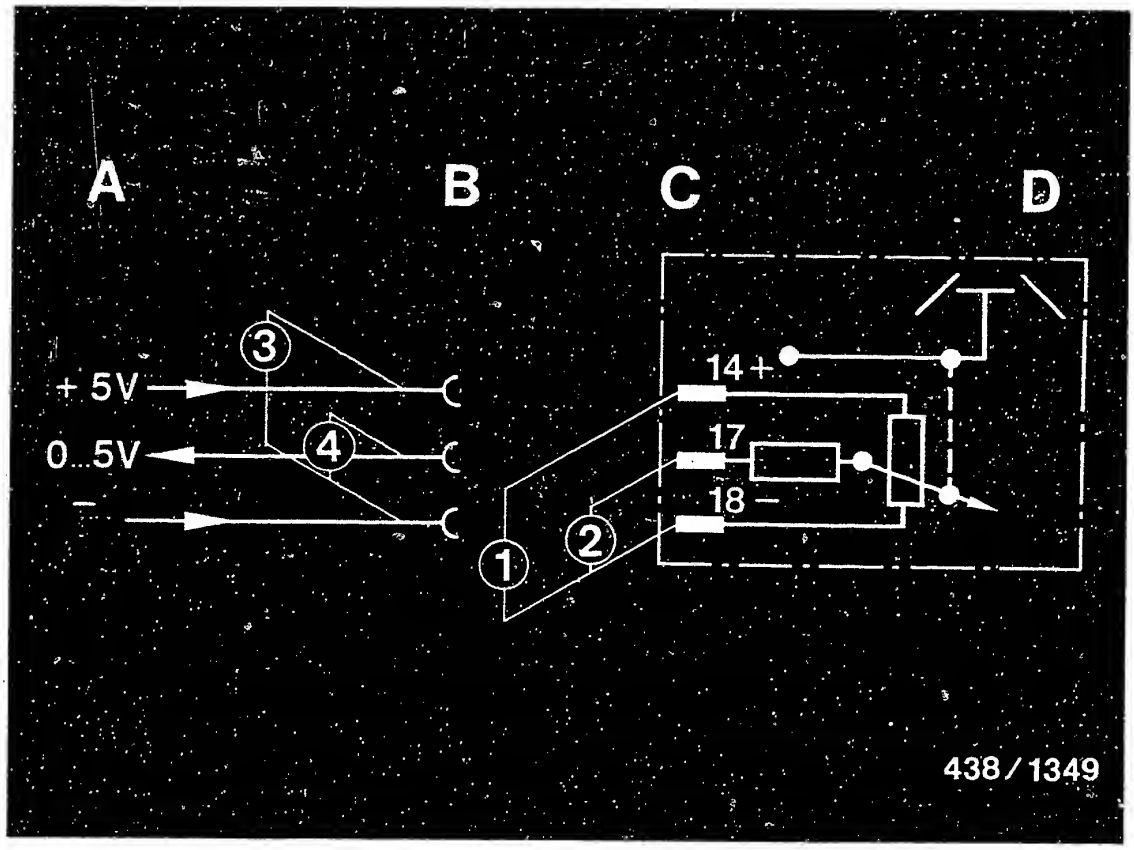
If need be, the potentiometer housing can be taken out and replaced. It is available as a service part.

The brush-type wiper cannot be taken out and replaced in after-sales service, because its retaining ring has been permanently seated on the shaft end of the control lever bearing shaft.

Be extremely careful when taking out and replacing the potentiometer housing so that the brush-type wiper is not damaged.
Avoid any and all contact with the brush-type wiper.

23.3 Test equipment required

Multimeter with R_i min. 20 kΩ (commercially available).



23.4 Circuit diagram

A = From the instrument cluster
B = Connecting line plug housing
C = Potentiometer connection plug
D = Potentiometer on the air-flow sensor

① and ② = Measurements of resistance (Plug disconnected)

③ and ④ = Measurements of voltage (Plug connected, ignition turned on)

23.5 Testing and adjusting

Take apart the 3-pin plug connection. Connect ohmmeter to the two external contacts 14 and 18 of the coupling plug.

Test specification: 3000 ... 5000 Ω.

No → Potentiometer housing defective. Take it out and replace it. Scratch off the locking paint from the four fastening screws and remove the fastening screws. Carefully lift off the potentiometer. Do not touch the brush-type wiper. Put on the new potentiometer housing with the seal ring inserted and tighten the fastening screws until light contact is made.

Yes

Connect ohmmeter to contacts 17 and 18 on the coupling plug. Slowly deflect the air-flow sensor plate by hand between idle and full load

Test specification:
at idle: 500 ... 900 Ω
at full load: 3500 ... 6000 Ω.

No → Reading deviates from test specification, or reading jumps.

No → Reading ∞Ω. Brush-type wiper defective. Take out and replace air-flow sensor.

Yes

Continued on H4/H5

Testing and adjusting (continued)

Remove the protective cap from the plug housing. Put the plug housing on the coupling plug. Carefully connect the test prods of the voltmeter to external contacts 14 and 18 on the plug housing. Turn on the ignition.

Test specification: 4.7 ... 5.3 V.

No → Check the power supply from the instrument cluster.
Positive to contact 14.
Ground to contact 18.

Carefully connect the test prods of the voltmeter to contacts 17 and 18 of the plug housing.
Turn on the ignition.
Air-flow sensor plate in zero position.

Test specification: 0 volts
The voltage must rise immediately when the air-flow sensor plate is deflected only slightly.

No → Adjust the potentiometer housing:
Scratch out the locking paint paint from the four fastening screws and release the screws slightly .Adjust the potentiometer housing to the test specification: 0 V by turning in the area near the slots.

Tighten the fastening screws with a tightening torque of 1.5 ... 2.0 Nm, and secure in place with locking paint.

Yes

Potentiometer okay.
Put the protective cap on the plug housing.

After-sales Service

Technical Bulletin

Packaging of goods under warranty

438

K-Jetronic (CIS)

VDT-I-438/101 B
10.1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components arrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

BOSCH Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung

After-sales Service

Technical Bulletin

Securing of idle-speed adjusting screws

K-Jetronic (CIS)

438

VDT-I-438/102 B
11.1976

According to a statutory regulation, changes have been made to § 47 of the German traffic licensing laws concerning exhaust gases and their outlets. This regulation was printed in full in traffic law sheet 13 of 15.7.75 .

Consequently, all motor vehicles with external-ignition engines must have their idle-speed adjusting devices secured from the 1st October 1976, so that adjustment of the screw is impossible without destroying the securing device. This should stop unskilled people from adjusting the installation of the idle-speed system and thereby illegally influencing the emission values. As from now, securing caps can only be used in the workshop and cannot be sold to customers for their own use.

Securing caps are produced in various colors. For after-sales service the following caps and colors are used:

downdraft air-flow sensor	
Blue	securing cap is not available from BOSCH. Part number is DB 000.997.59 86 from the Deutsche Vergaser Gesellschaft K 34 520
updraft air-flow sensor	
Red	Part number 3 430 522 002

These stipulations are only valid in countries where ECE regulations (Economic Commission for Europe) apply. The air-flow sensors must however be converted for the use of these securing caps, as a matter of principle. The caps can also be used in countries not subject to ECE regulations, to prevent dirt penetrating through the pipe to the adjustment in the case of updraft air-flow sensors.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

Technical Bulletin

EXCHANGEABLE NON-RETURN VALVES
in electric fuel pumps 0 580 254

VDT-I-438/104 En
3.1984
(Replaces Ed. 3.1983)

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal
0 580 254 001	1 587 010 500	---	---
003	502	---	---
005	502	---	---
007	500	---	---
008	508	---	---
010	508	---	---
011	002	---	---
941	002	---	---
942	002	---	---
945	006	---	---
947	002	---	---
948	005	---	---
949	002	---	---
950	006	---	---
952	002	---	---
953	501	---	---
954	002	---	---
956	002	---	---
957	002	---	---
959	002	---	---
960	002	---	---
961	002	---	---
963	005	---	---
964	002	---	---
965	002	---	---
967	002	---	---
968	002	---	---
970	002	---	---
972	002	---	---

Electric fuel pump	Parts set (non-ret. valve and seal ring)	Non-return valve	Seal
0 580 254 973	1 587 010 002		
975	003[4]		
976	004[3]		
978	1 587 410 901		
979	010 004[3]		
980	002		
982[1]	003[4]		
982[2]	1 587 410 901		
984	010 004[3]		
985	---	1 583 385 006	1 580 203 002
986	---	386 011	001
987	---	008	001
988	---	008	001
989	---	008	001
990	---	385 004	002
991	---	004	002
992	1 587 010 001	---	---
996		386 001	001
998		385 004	002
9 580 233 014	508	---	---
234 003	002	---	---
005	002	---	---

[1] = up to FD 822 [2] = as from FD 823

[3] = parts set ..003 can also be used (delivery-line connection at 90°)

[4] = parts set ..004 can also be used (delivery-line connection axial)

Please direct questions and comments concerning the contents to our authorized representative in your country.

After-sales Service

Technical Bulletin

HOT-STARTING PROBLEMS

438

VDT-I-438/105 En
3.1980

K-Jetronic

Replaces Ed. 2.1980

Hot-starting problems can occur in various vehicles fitted with K-Jetronic. This means that when an engine is switched off whilst still hot and then switched on again after a short period, it does not start as well as it should.

The engine, the ignition system and the K-Jetronic system in these vehicles should be carefully checked. With the K-Jetronic particular attention should be paid to the:

complete system (in case of leaks),
injection valves (in case of leaks),
correct position of the air-flow sensor plate (rest position).

Instructions can be found in the vehicle-related repair manuals VDT-W-438/5.. .

If the engine still does not start satisfactorily when hot, even after checking, a timing relay can be fitted in K-Jetronic systems which are not equipped with a solenoid valve for reducing the control pressure as additional starting help.

Timing relay 0 340 000 003 controls the start valve during hot starts. The start valve then injects extra fuel intermittently (sometimes cutting out completely.

The timing valve is fitted according to the wiring diagram (see reverse side). The fitting of this relay will be charged for.

After fitting the timing relay starting should be carried out as follows:

Vehicles with start valve in intake manifold - with open throttle valve,
Vehicles with start valve in idle duct - with closed throttle valve.

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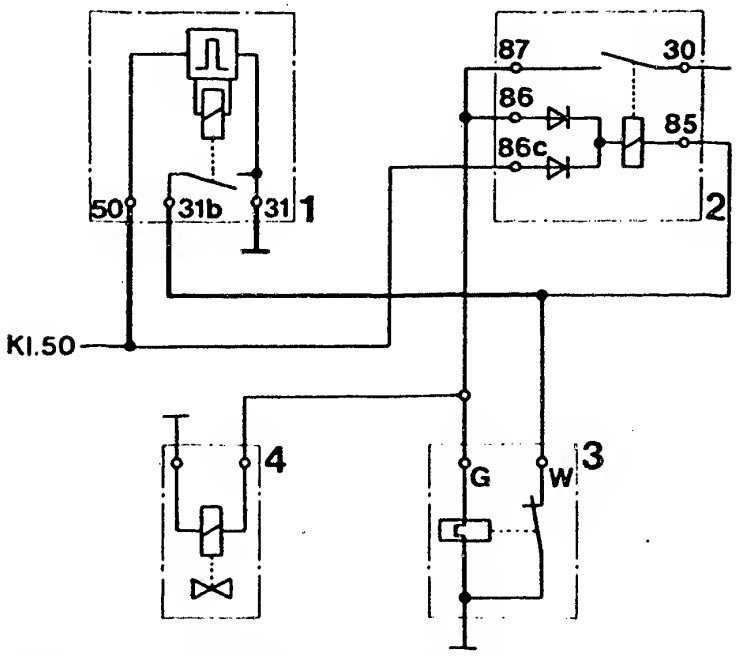
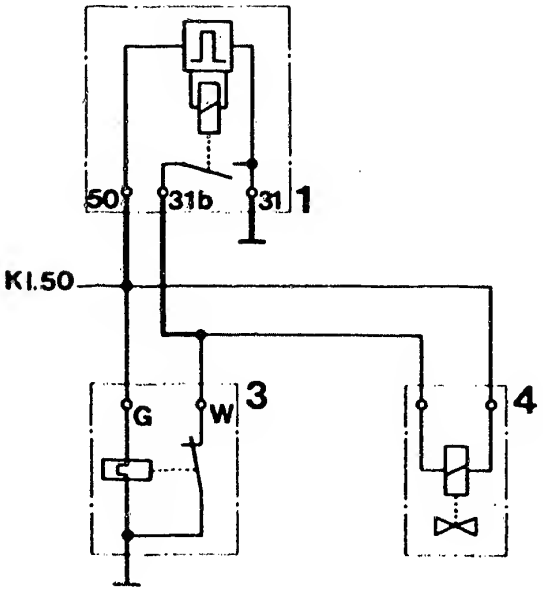


K-Jetronic system with post-injection relay

1 = Timing relay 0 340 000 003
2 = Post-injection relay
3 = Thermo-time switch
4 = Start valve



K-Jetronic system without post-injection relay

After-sales Service

Technical Bulletin

TUBE FITTING WITH FILTER IN WARM-UP REGULATOR 0 438 140 ...

VDT-I-438/106 En
4.1980

Warm-up regulator 0 438 140 065, used in MB 230 E, has a filter in the tube fitting for the fuel inlet to prevent dirt getting in.

When other warm-up regulators with the same connections give trouble or fail because of dirt getting in, then we recommend that you fit the new warm-up regulator with this tube fitting with filter, part no. 1 433 356 802.

During assembly a flat seal ring A 10 x 14 DIN 7603-C-CU, part no. 2 916 710 649, is laid underneath and the tube fitting is tightened with 20...22 Nm (2.0-2.2).

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After-sales Service

Technical Bulletin

O-RING FOR K-JETRONIC INJECTION VALVES

0 437 502

VDT-I-438/108 En

7.1982

For K-Jetronic injection valves with O-ring seals the O-ring is available as a service part under Part No.: 3 430 210 600.

This O-ring is also listed on service-part microfiche EE...* together with other Jetronic service parts.

* See microfiche EE00 under 0 280 ..

Since the O-rings are exposed to extreme temperatures, they should be replaced whenever service work is performed.
"Unmetered air" which is drawn in through leaky injection valve seals is a frequent cause of trouble.

Please direct questions and comments concerning the contents to our authorized representative in your country.

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After-sales Service

Motor Vehicle Service Information

EXPORT VEHICLES WITH
EMISSION CONTROL SYSTEMS

VDT-I-Gen. 042 En.
12. 1981

K-Jetronic and L-Jetronic

Export vehicles for countries with stringent exhaust emission regulations are equipped with various emission control systems. To meet the legal requirements, these systems are installed either individually or in combination, depending on the model version.

Emission control system	installed predominantly in export vehicles				
	Sweden	Australia	Canada	USA	Japan
Exhaust-gas recirculation*	●	●	●	(●)	(●)
Secondary-air induction*	●	●	●	(●)	(●)
Secondary-air injection*	●	●	●	(●)	(●)
Catalytic converter*	-	-	-	●	●
Lambda closed-loop control	-	-	-	●	●

The vehicle-related After-Sales Service Instruction Manuals for the K-Jetronic and L-Jetronic describe the construction, function and operating principle of the emission control systems. The influence of these systems should be borne in mind particularly when adjusting the idle speed and CO concentration.

Export vehicles are sometimes also encountered in countries which do not have particularly stringent exhaust emission legislation. This Service Information publication summarizes the various emission control systems and provides information for the After-Sales Service in countries with exhaust emission legislation which does not require such emission control systems or unleaded fuel.

* Not made by Bosch

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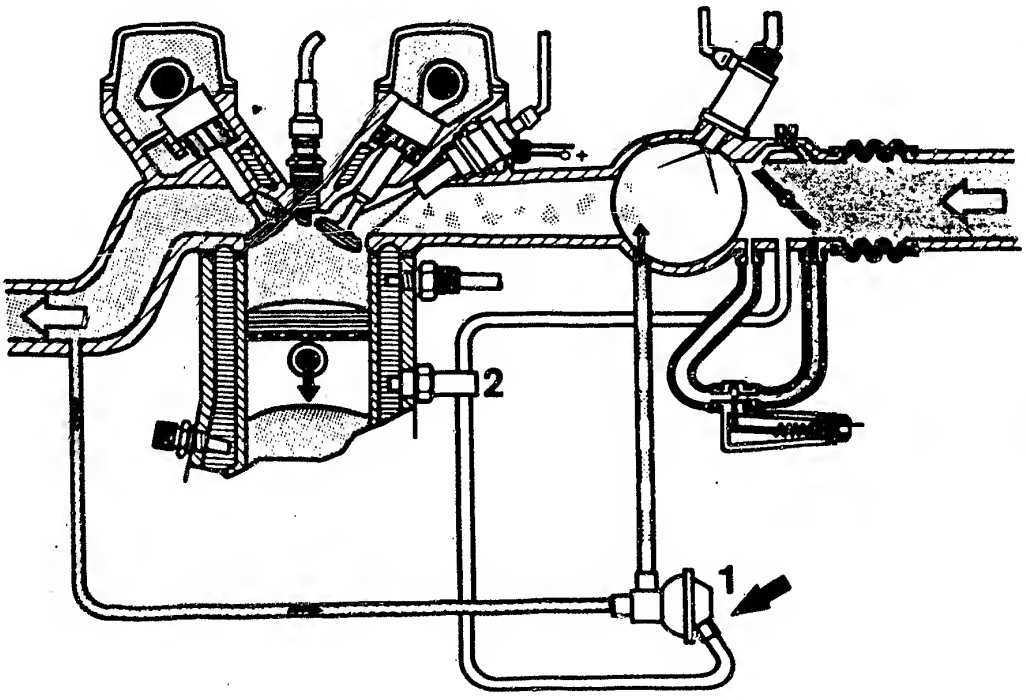
1. Exhaust-gas recirculation (EGR)



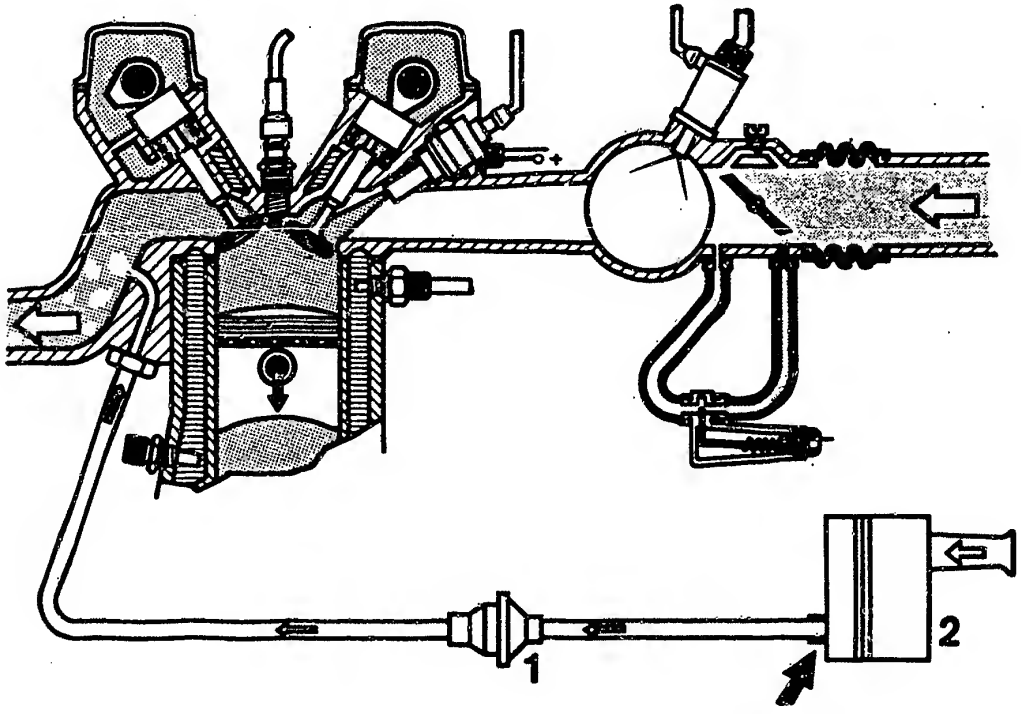
1 = Exhaust-gas recirculation valve 2 = Thermo-valve

Some of the exhaust gas is returned to the intake manifold via a vacuum-controlled exhaust-gas recirculation valve. This recirculation of exhaust gas into the combustion chamber lowers the combustion temperature and reduces the emission of nitrogen oxides (NOx). The thermo-valve and the position of the vacuum tapping port on the throttle-valve assembly ensure that exhaust gas is only recirculated when the engine is warm and only at part load. There is a reduction in engine speed of about 200 min^{-1}. Exhaust-gas recirculation is inoperative at idle, full-load and when the engine is cold.

When testing or adjusting the idle speed and CO concentration, remove and seal off the vacuum control line (arrow) on the exhaust-gas recirculation valve in order to ensure that the exhaust-gas recirculation system is inoperative.

In countries without stringent exhaust emission legislation it is not necessary to shut down the system.

2. Secondary-air induction (e.g. Volvo Pulsair system)



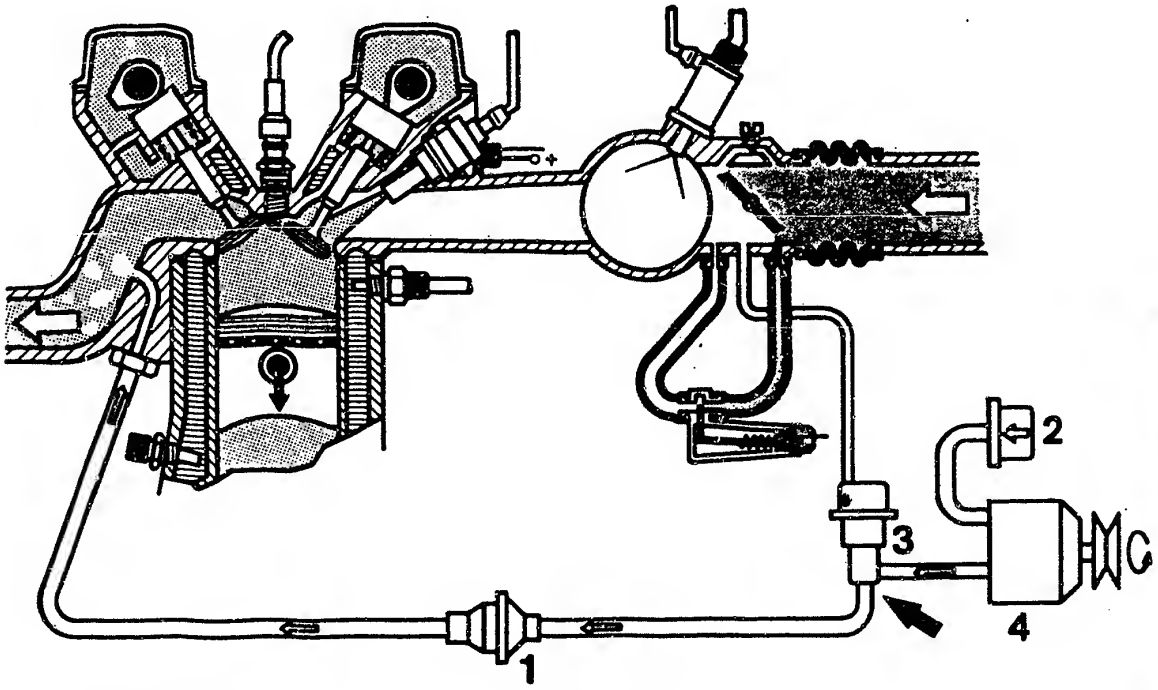
1 = Non-return valve 2 = Air filter

The pulsating alternation between overpressure and depression in the flow of exhaust gas inducts fresh air into the exhaust ports via a non-return valve. Unburned residues of carbon monoxide (CO) and hydrocarbons (HC) are partially after-burned, leading to fewer pollutants in the exhaust gas.

When testing or adjusting the idle speed and the CO concentration, the secondary-air induction system must be rendered inoperative. To do this, remove the hose between the non-return valve and the air filter on the air filter (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air induction system.

3. Secondary-air injection



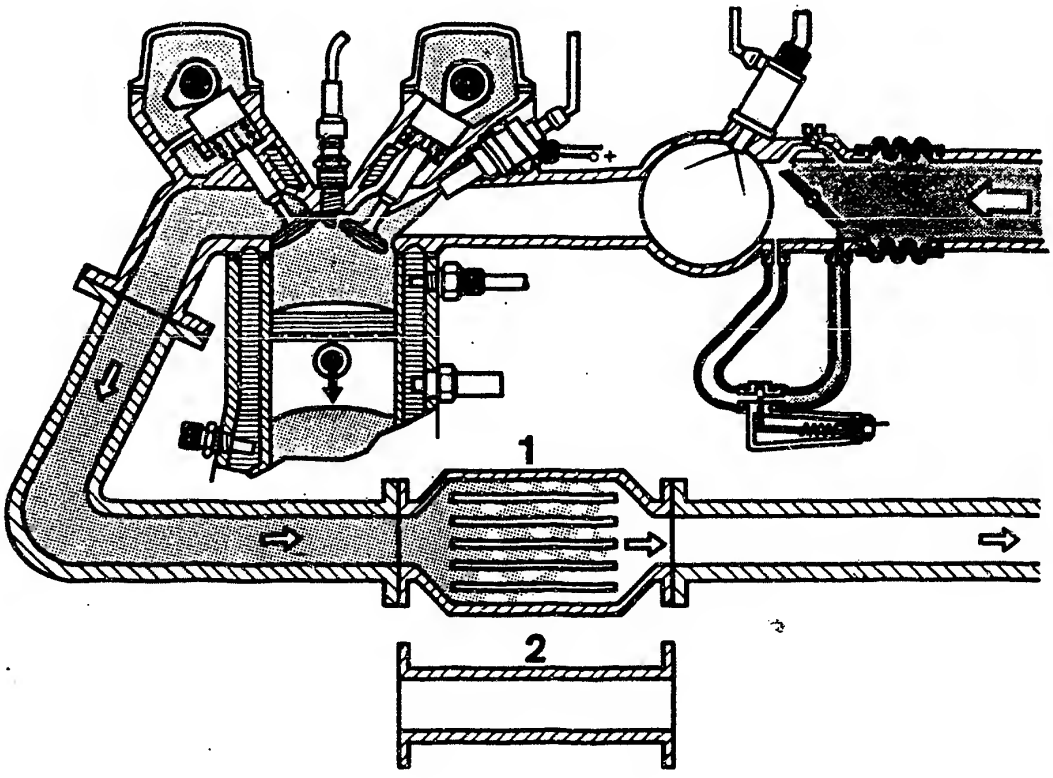
1 = Non-return valve
2 = Air filter
3 = Change-over valve
4 = Air pump

An air pump driven by the engine inducts fresh air through the air filter and forces it via a non-return valve into the exhaust ports. As in the case of secondary-air induction, there is a partial after-burning of the CO and HC residues. This makes the exhaust gas cleaner. A vacuum-controlled change-over valve controls the operation of the secondary-air injection system.

When testing or adjusting the idle speed and the CO concentration, shut down the secondary-air injection system. To do this, remove the hose from the outlet of the change-over valve (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air injection system.

4. Catalytic converter



1 = Catalytic converter 2 = Intermediate pipe

The single-bed catalyst installed in the exhaust system in export vehicles (also with lambda closed-loop control) reduces all three pollutants CO, HC and NOx to a minimum. The catalytic surface triggers chemical reactions of the pollutants, rendering them non-toxic.
Important: Proper operation only possible in conjunction with unleaded fuel (at present only in USA and Japan).

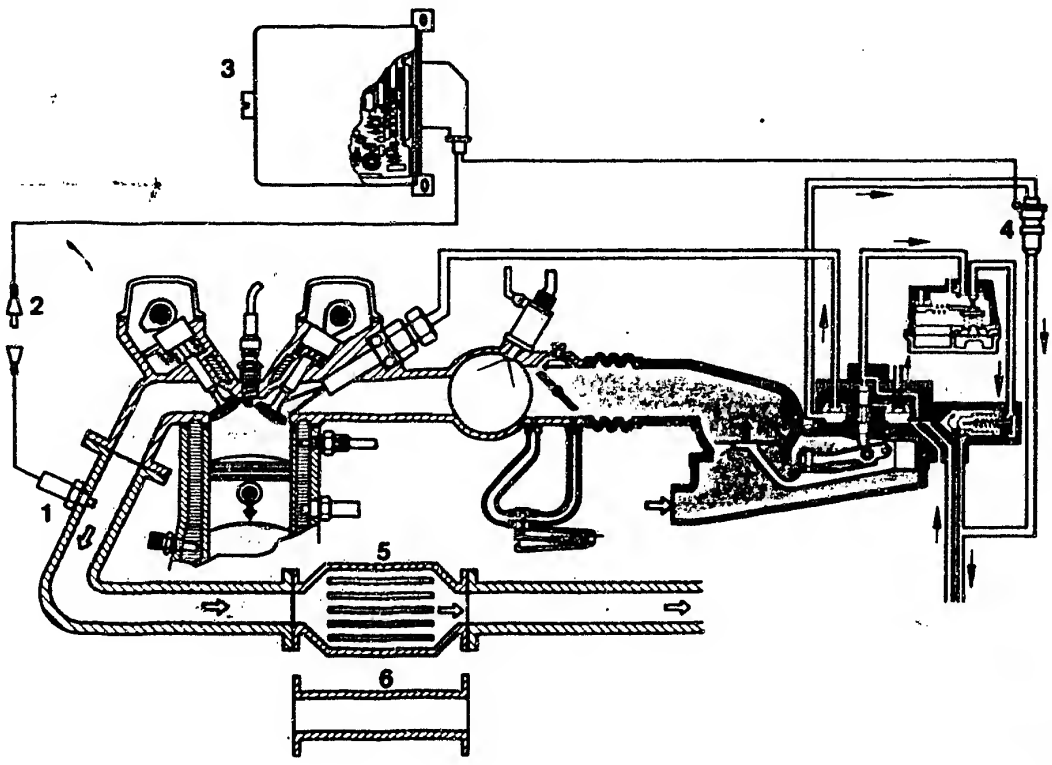
When testing or adjusting the idle speed and the CO concentration, the catalytic converter can be neglected since the exhaust-measuring point is upstream of the catalyst.

Caution!

If the vehicle is operated on leaded fuel (predominantly in countries without stringent exhaust emission legislation) the catalytic converter must be removed. If not removed, the catalytic converter would become clogged up and lead to a reduction in the power output of the engine.

Appropriate intermediate pipes for converting the exhaust system are available from the vehicle manufacturer.

5. Lambda closed-loop control



1 = Lambda sensor
2 = Plug
3 = Control unit
4 = Timing valve
5 = Catalytic converter
6 = Intermediate pipe

Export vehicles for the USA and Japan are equipped with lambda closed-loop control. This additional function of the K-Jetronic or L-Jetronic is not a downstream emission control system, but ensures a low pollutant content in the exhaust gas by means of optimum mixture preparation. Additional exhaust-gas recirculation, secondary-air induction or secondary-air injection is therefore not necessary in most cases. Like the catalytic converter, the lambda sensor (in the exhaust gas) operates only with unleaded fuel.
If the vehicle is operated on leaded fuel, the lambda sensor becomes clogged up and ceases to operate. The control unit detects this and switches from closed-loop to open-loop control. The system then operates on a fixed air-fuel ratio in the same manner as a K-Jetronic or L-Jetronic without lambda-closed-loop control. Before operating on leaded fuel, the lambda sensor should be removed and the installation hole should be closed off with a screw plug M18x1.5 (length of thread max. 8.5 mm). The disconnected plug (2) of the sensor connecting cable should be insulated and fastened to a suitable place on the vehicle body.

Caution!
Under no circumstances must the control unit or the timing valve be shut down on the lambda closed-loop control of the K-Jetronic.
The catalytic converter should be replaced by an intermediate pipe.

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After-sales Service

Motor Vehicle Service Information

COLD START - WARM UP
ACCELERATION PROBLEMS

VDT-I-Gen. 051 En
10.1982

in vehicles with Jetronic

Customer complaints

- Starting problems with a cold engine
- Engine bucking during warm up
- Uneven idle (speed fluctuations)
- Engine cuts out during acceleration (flat spot)
- Loss of output

Cause

When the ignition and the Jetronic have been checked and the test specifications given have been reached, a possible reason for the problems quoted could be coke residue on the intake valves.

The carbon residue thus present delays a continuous flow of fuel from the injection valve to the combustion chamber on account of its sponge effect.

As a result of this the air-fuel mixture can in some cases be so lean, that it can no longer be ignited.

Loss of output results from a reduction in the amount of cylinder filling and is caused by a very high coking.

Complex connections between qualities specific to the engine, the engine oil and fuel used, as well as relevant driving cycles (e.g. mainly short stretches) can cause such coking on the intake valves.

Remedy

Dismantle the intake valves and remove the deposits.

Please note

Various vehicle manufacturers are working at the moment on other measures, such as cleaning with additives. Results of these tests are not yet available.

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After-sales Service

Motor Vehicle Service Information

HOT-STARTING PROBLEMS
VEHICLES WITH K-JETRONIC

VDT-1-Gen. 056 En
2.1983

This Service Information contains special suggestions on how to remedy hot-starting problems concerning the general information contained in Service Information VDT-J-Gen. 050 of 9.1982

Customer complaint (Symptom of trouble)

- After the vehicle has been standing for a short while the engine which is still hot has difficulty starting again.
- After hot-starting the engine runs rough (e.g. only on 2 or 3 cylinders).

Causes

- Formation of vapor bubbles in the hot fuel, particularly in the injection valves and injection lines, due to hydraulic leaks.
- Formation of vapor bubbles despite the absence of hydraulic leaks as a result of using a poor grade of fuel.

Owing to a high percentage (approx. 8%) of volatile alcohols (e.g. methanol) in the fuel its vapor pressure is higher than normal.
The consequences are:
- Formation of vapor bubbles
- Chattering and poor spray formation of the injection valves.
- Lean mixture composition in some cylinders due to a shortage of fuel.

Tests

Before testing, make sure that he ignition system and valve timing are O.K.

Checking the K-Jetronic system

Pay particular attention to the following sources of trouble:

- Hydraulic leaks in the fuel system with the engine hot.
  The vehicle-specific minimum pressures 10 and 20 minutes after stopping the engine must be observed.
- Leaks on injection valves
  No formation of drops within 15 seconds
- Zero-position of air-flow sensor plate.
  Top edge of air-flow sensor plate must be flush with the start of the conical section of the funnel.

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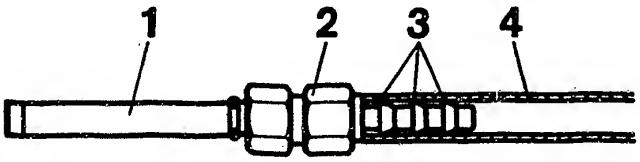
• Sealing edges (so-called "fishbone section") of the connecting parts must be securely seated in the polyamide injection line.
The fit may have become loose due to frequent changes of temperature.
If necessary, replace injection lines.



1 = Injection valve
2 = Connecting part
3 = Sealing edges
4 = Injection line

Finding

If the K-Jetronic system has been checked and if all the measured data are within the test-specification tolerance, then the grade of fuel can be taken as the cause of the trouble.

Corrective action

It may be sufficient to change the brand of fuel.

After-sales service solutions

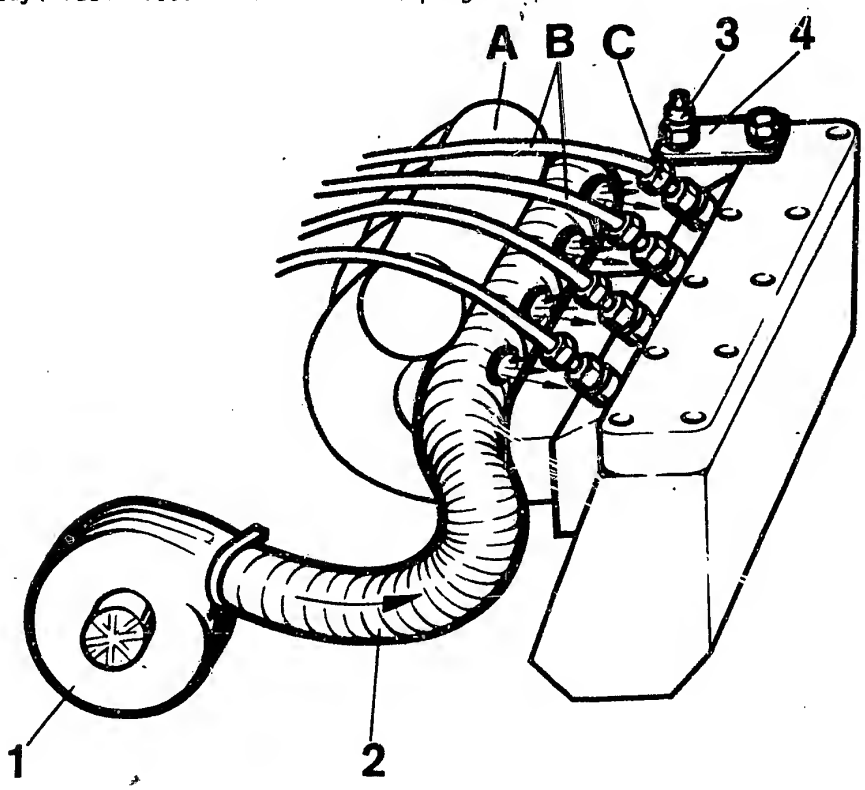
Recommendation for acceptable starting performance (shorter than 5 seconds):
Installation of time-pulse relay 0 340 000 003 as described in Technical Bulletin VDT-I-438/105 (3.1980).
Due to the time-pulse relay the start valve is energized intermittently during hot-starting. Additional fuel is injected through the start valve and this compensates for the shortage of fuel from the injection lines caused by vapor bubbles.
However, smooth running of the engine after starting is only obtained by forcing the vapor bubbles out of the injection lines (by wide opening of the throttle).

Recommendation for good starting performance and smooth engine running:
Installation of injection valve cooling by means of additional fan and thermo-switch. The formation of vapor bubbles is (largely) prevented by this after-sales service measure.

Injection valve cooling

Necessary components and parts

- Centrifugal fan — e.g. 0 130 007 801 12 V/6A 4000 min^{-1}
  or — VWW 035 959 175A. possibly with further connecting parts.
- Thermo-switch — VWW 035 959 481B — On: 100°C. Off: 94°C
- Air guide hose — Aluminium or polyamide hose, 70 mm or 50 mm dia., flexible, oil-and fuel-resistant, heat-resistant up to + 120°C (commercially available, e.g. Westaflex, 4830 Gütersloh, Zum stillen Frieden 22).
- Hose clamps
- Brackets for fan and thermo-switch (user-fabricated)
- Relay, fuse holder with 8 A fuse, plug.



New components

1 = Centrifugal fan
2 = Air-guide hose
3 = Thermo-switch
4 = Holding plate

Parts of the engine

A = intake manifold
B = injection lines
C = injection valve

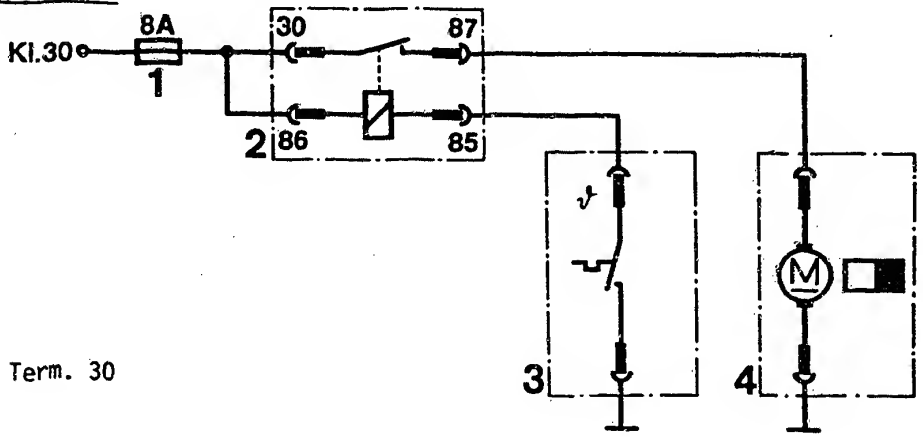
Layout

- The fan should be installed so that clean air is drawn in from a point which is as cool as possible. Protect the intake side from dirt.
  Example: A low position in the engine compartment behind the radiator grille or near the left-hand or right-hand side-wall.

- The air-guide hose is laid free of tension from the fan to the intake manifold, along the injection valves.
  Seal off the end of the hose and make openings at the side toward the injection valves, the openings having a diameter of approx. 25 mm.
  Fix the air-guide hose in position with hose clamps and bracket so that engine vibrations are absorbed by the flexible air-guide hose.

- Install the thermo-switch near the worst cooled injection valve (usually on the last cylinder). The place of installation should be selected such that the thermo-switch has, if possible, the same temperature as the injection valve. This applies both to the heat from the engine as well as to the cooling from the auxiliary fan.
  However, the flow of air from the fan must not be aimed directly at the thermo-switch (otherwise the on-time of the fan is too short).
  Example: By means of a holding plate the thermo-switch can be mounted on the valve cover or cylinder head by means of an existing screw.

Electric circuit



Kl.30 = Term. 30

1 = Fuse holder with 8 A fuse
2 = Relay with plug-in base
3 = Thermo-switch
4 = Fan

Make electric installation in accordance with the circuit diagram. Pay attention to ground connection and thermal contact of thermo-switch.

After-sales Service

Motor Vehicle Service Information

Electrical Equipment

FITTING POSITION AND MARKING OF
AIR-FLOW SENSOR PLATE 3 430 100 ..

VDT-I-Gen. 060 En
10.1983

In air-flow sensors for
K and KE-Jetronic

General information/fitting position

As a result of the stamping process during manufacturing, air-flow sensor plates have a sharp and a slightly rounded edge around the circumference. The sharp edge serves for measuring the air flow and must therefore be fitted so that it faces the air stream.

- The sharp measuring edge of the air-flow sensor plate points in the direction of the air filter.
- The slightly rounded edge points in the direction of the air funnel and intake manifold. 6 and 8 cylinder mixture-control units with downdraught air-flow sensor have air-flow sensor plates with a bezel on the otherwise usual rounded edge.

Marking

- Up till now most air-flow sensor plates have been marked on a surface with 5 punch marks or with the word "TOP".
  This marked surface must always be at the top of the air-flow sensor.
  This applies to both updraught and downdraught air-flow sensors.
- For precision reasons, an increasing number of air-flow sensor plates will be ground at the circumference during production as from mid-1983. On account of the sharp-edged surfaces on both sides, there will be no marking of any kind. These air-flow sensor plates can be fitted whichever way is desired.

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